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MACKENZIE VALLEY PIPELINE INQUIRY

Government  
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF  
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A  
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS  
CROWN LANDS WITHIN THE YUKON TERRITORY AND  
THE NORTHWEST TERRITORIES, and  
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY  
THAT MIGHT BE GRANTED ACROSS CROWN LANDS  
WITHIN THE NORTHWEST TERRITORIES,  
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE.

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Inuvik, N.W.T.

February 18, 1976

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PROCEEDINGS AT INQUIRY

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Volume 128

CANADIAN ARCTIC  
GAS STUDY LTD.

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Committee;  
Mr. Garth Evans

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

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Julian T. INGLIS

- In Chief 19589

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H.R. Trudeau  
Cross-Exam by Evans  
Inuvik, N.W.T.

February 18, 1976

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. BAYLY: Mr. Commissioner,  
I have one of the reports which was requested be tabled  
as a result of Dr. Snow's evidence, and that is a  
report entitled, "The Effect And Fate Of Crude Oil Spilt  
On Two Arctic Lakes", reprinted from the 1975 conference  
on Prevention and Control of Oil Pollution, proceed the  
proceedings of March 25 to 27, 1975 in San Francisco,  
and I'll just enter that as an exhibit.

("THE EFFECT AND FATE OF CRUDE OIL SPILT ON  
TWO ARCTIC LAKES", BY N.B. SNOW AND B.F. SCOTT,  
MARKED AS EXHIBIT 483)

The other, I believe, are  
available and the Commission counsel and I will be  
taking steps to make them exhibits.

MR. EVANS: I believe it's my  
turn to cross-examine Mr. Trudeau.

HUGH ROBERT TRUDEAU, resumed:  
CROSS-EXAMINATION BY MR. EVANS:

Q Mr. Trudeau, I wonder,  
yesterday you, in your prepared evidence, discussed  
seismic charges on the ocean floor, drilling a hole  
and through the ice. I wonder if you could elaborate  
on that? On exactly how that would be done?

A On the techniques of doing  
this?

Q Yes.

A Well, the drilling of  
these charges into the bottom is done in shallow water  
situations, where there's probably no more than five or  
six feet of water below the ice. What they do is they  
simply move a small land rig over the ice, they drill





H.R. Trudeau  
Cross-Exam by Evans

1 their hole down into the bottom, and depending on the  
2 type of bottom that they're working in, they can either  
3 withdraw the drillstem and bit, and load through the  
4 hole -- that's not very common though because usually  
5 the hole will slough in on them, so what they'll do is  
6 they'll load down through the drill stem, the drill  
7 stem being hollow, of course. They put the charge into  
8 the bottom and then they withdraw the drillstem.

9 They'll probably set several  
10 of these charges in along <sup>the geophones</sup> line, and then they set out  
11 their , and fire them off. That's basically how  
12 they do it.

13 THE COMMISSIONER: They set up  
14 the geophones on top of the ice?

15 A Yes. They usually will  
16 set them on top of the ice, although in some areas  
17 where they encounter problems with their recordings, it  
18 has been proposed to drill holes through the ice, set  
19 hydrophones on the bottom, and then fire and then  
20 withdraw; but of course in the wintertime, that's a  
21 problem because you have to do it quickly in order to  
22 get all your hydrophones back out before they freeze in.  
23 The common way would be to do it on the ice.

MR. EVANS:

24 Q Well, so this wouldn't be  
25 a practical method in other than very shallow water?

26 A That's right.

27 Q You couldn't use it in  
28 areas like the Sverdrup Basin, where it's maybe a hundred  
29 or more feet of water?

30 A No, they don't.





H.R. Trudeau  
Cross-Exam by Evans

1 Q Well, how would they do  
2 the seismic work in an area such as the Sverdrup Basin?

3 A Well, the only way that  
4 they can do it is by simply drilling a hole in the ice  
5 with a normal ice auger, and setting their charge at  
6 some point in the water column, and firing it that way.  
7 This is in fact the way that they have been doing it, up  
8 in the high Arctic areas, and when they first went up  
9 there, they requested permission to use up to twenty  
10 pound charges, but they indicated that the normal -- in  
11 the normal operation, they would use charges roughly in  
12 the area of two pounds. Well, we were very **reluctant**  
13 to permit this, however we felt that in most of these  
14 deep water areas, it was unlikely that they would  
15 encounter large schools of fish; there may be the odd  
16 fish around, but there wouldn't be any large concentration.  
17 So we authorized it, but with considerable pressure from  
18 us to industry, to do something about that method, that  
19 we found that a totally unacceptable method, on the  
20 philosophical basis, anyway.

21 They have tried, and they've  
22 now gotten their shooting methods down to the point  
23 where they're using twenty-five grain aquaflex in  
24 roughly twenty-five foot lengths. Now, to get a feeling  
25 for the size of that charge, if you -- I believe it's  
26 something like 7,000 grains to the pound -- the example  
27 I used in my testimony referred to 200 grain aquaflex,  
28 so what they're using now is 25 grain aquaflex and only  
29 a 25 foot piece, so it's a very small charge; and they  
30 simply lower that down vertically into the water column





1 and fire it.

2 Q So in this particular case  
3 they received an exemption from the standards that you  
4 set out on page 8 of your prepared testimony?

5 A That's right.

6 And that was the only area  
7 that we did not apply this. This has been applied in  
8 the Mackenzie Delta which was the main area where seismic  
9 operations were being carried on.

10 Q Now sir, according to your  
11 testimony that you raised your standards with respect  
12 to how deep the charges had to be set, what was the  
13 reason for that?

14 A Well, as I indicated, when  
15 we first got into this, we didn't have very much  
16 information at all on the effects of seismic. We began  
17 collecting this information immediately, and as these  
18 reports came in, they were sent down to our professional  
19 people in the Freshwater Institute. The scale that's  
20 being applied was one that was given to us by Mr. John  
21 Millen who I believe has appeared before this Inquiry,  
22 from the Pacific region. He was at time within our  
23 section in the Institute, how he arrived at those figures  
24 I couldn't tell you, but that's where they originated  
25 from.

26 Q Now, on page 10 of your  
27 prepared testimony, you stated that "none of the studies  
28 that I am aware of, however, did any work on sub-lethal  
29 effects". Do you know if there are any studies  
30 underway on sublethal effects of seismic charges?



H.R. Trudeau  
Cross-Exam by Evans

1 A Not to my knowledge, there  
2 isn't, no.

3 Q Do you think it would be  
4 a good idea if we did study that?

5 A Well, I'm not a scientist  
6 and I'm not really that familiar with the problems  
7 involved in launching this type of a study, so I don't  
8 know whether they're feasible or not. Looking at it from  
9 a management point of view, there's information that I  
10 would like to know, and from that point of view I would  
11 think it would be desirable.

12 Q Right, that was the point  
13 of view I wanted to get an answer from you on.

14 Now, on page 13 you state that  
15 black powder is far less lethal to fish than high  
16 velocity explosive. Would it to your knowledge be  
17 feasible to use black powder in seismic operations?

18 A Well, I've approached  
19 industry on that question, and they indicate to me that  
20 black powder is not desirable because they require  
21 considerably larger charges to get the same results,  
22 which is a money and a logistics problem, and they also  
23 indicate that it's quite a bit more dangerous powder to  
24 work with, so if, you know, as I look at it, even if there  
25 was indication that black powder would be acceptable from  
26 a data point of view, I would still have to be rather  
27 concerned about the dangerous aspects of the people handling  
28 it. So, this is what they've told me.

29 Now, there are options. There  
30 have been in the States some combinations of powders <sup>that</sup> have





H.R. Trudeau  
Cross-Exam by Evans

1 been developed which develop characteristics similar  
2 to black powder from the pressure point of view, and  
3 at the same time are getting fairly good data for  
4 seismic purposes. I've approached C.I.L. and other  
5 companies of this sort, and this particular type of  
6 powder doesn't seem to be available right now, for some  
7 reason. Now I'm still involved in trying to find out  
8 whether it is or not, but that's where it stands right  
9 now.

10 Q So there may be a kind  
11 of powder --

12 A There may be some  
13 possibility of a compromise between the high velocity  
14 and the black powder, but at this point I don't know  
15 whether that's possible or not.

16 Q On page 15 you discuss  
17 linear explosives. Do these give as good a results as  
18 geogel?

19 A Well, the indications that  
20 I've gotten from industry, seem to indicate that they  
21 are acceptable. Whether they're as good as geogel or  
22 not, I don't know. You know, that's a technical --

23 Q They've indicated that  
24 they get acceptable results...

25 A They're living with it, we're --

26 Q Okay. Now, yesterday Mr.

27 Longlitz testified, and in response to a question, he  
28 stated that the -- discussed the potential problems  
29 for enforcement officers becoming friendly with the  
30 companies they're regulating; and he suggested a





H.R. Trudeau  
Cros-Exam by Evans

1 rotation of officers was one method of limiting the  
2 problem. What's your opinion of that proposal?

3 A Well, I suppose potentially  
4 that may be a problem, but I think people tend to get a  
5 little paranoid about these sort of thing.. You know,  
6 I don't begin with the assumption that people are basically  
7 susceptible to bribes and that sort of things. I have  
8 complete faith in my enforcement staff, and I don't have  
9 any doubts at all that even though they may have a good  
10 working rapport with the industrial representatives that  
11 there's any problem with the enforcement standards.

12 Q I wasn't actually thinking  
13 of bribes, I was thinking of more subtle kind of --

14 A No, I understand, you know,  
15 we're only talking a matter of degrees. I mean, a bribe  
16 is a bribe whether it's in terms of cash or a meal or  
17 whatever.

18 Q Okay. How large an  
19 enforcement staff do you have?

20 A Well, on the books I have  
21 a total of 13 officers in the Northwest Territories. In  
22 actual fact, though, I have three of those positions  
23 frozen, and I'm occupying the other one, which is not  
24 in effect an enforcement position any longer, so that  
25 leaves me with nine officers working in the field.

26 Q Do you think that's  
27 adequate to -- cover the area?

28 A No I don't.

29 Q How many officers do you  
30 think you'd need to do a really good job of enforcement?





H.R. Trudeau  
Cross-Exam by Evans

1                   A     Well, that would be a rather  
2 complicated question to answer. Our area of involvement  
3 includes the enforcement responsibility for marine  
4 mammal harvests throughout the Northwest Territories,  
5 and at present we have nobody at all stationed in the  
6 eastern Arctic, so, you know the problem with trying  
7 to determine how many man years you need to do an  
8 effective job, is a little difficult, because in our  
9 area of enforcement, our work is primarily during the  
10 summer months, which leaves you with quite a long period  
11 of time with minimal amount of enforcement work to do.

12                   It's been my opinion that you  
13 are better off to have a small effective enforcement  
14 staff that is kept very busy during peak periods, rather  
15 than have a lot of people who, you know, aren't kept  
16 that busy and results in a lot of unhappiness amongst  
17 the staff; so although our officers are working fairly  
18 long hours when they're busy, I think they're much  
19 happier for it, and I prefer to keep the staff fairly  
20 small.

21                   Q     Well, could you give us  
22 a ballpark figure, as an estimate? I realize it's  
23 difficult to put a figure on it.

24                   THE COMMISSIONER: Well, you  
25 have ten at work now.

26                   A     I have -- well, on the  
27 books I have twelve. I have actually nine working  
28 now, ten with myself, of course.

29                   THE COMMISSIONER: Right.

30                   A     I would like to see another





H.R. Trudeau  
Cross-Exam by Evans

1 man stationed in Inuvik, one in Frobisher Bay, one in  
2 Rankin Inlet and another one in Yellowknife, so --

3 THE COMMISSIONER: Another one  
4 where?

5 A Yellowknife.

6 THE COMMISSIONER: M-hm. So  
7 you need two more in the Mackenzie Valley, one at  
8 Yellowknife --

9 A One more -- well, the one  
10 in the Yellowknife area I would try to utilize in the  
11 high Arctic, but the man year itself wouldn't be much  
12 use without a budget to cover the high Arctic, and that's  
13 really the prohibitive factor right now. So three more  
14 would give me fifteen men total. I think we could do  
15 a quite adequate job with that.

16 MR. EVANS: Do you think that  
17 if the pipeline were built, that this would increase  
18 the requirement for enforcement staff?

19 A Oh, absolutely.

20 Q How much?

21 A Well, besides just the  
22 pipeline, there are other things going on in the valley.  
23 There's the highways proposals and this sort of thing.  
24 As these roads are developed and access to lakes and  
25 streams is made easier, I could see quite an increase  
26 in sports fishing pressures. There's possible conflicts  
27 between sports fisheries, commercial fisheries and  
28 domestic fisheries. Again, I would want to keep the  
29 number of people fairly low, so I would say with another  
30 man in Inuvik, I've got one in Fort Simpson now, I would





1 like  
2 to see another probably in Norman Wells, and after that  
3 I guess we would have to monitor the development and  
4 respond as we detected the need.

5 Q You'd imagine there'd be  
6 be more requirement than that though?

7 A It's quite possible, but  
8 without knowing the scope of the development it's hard  
9 to really put a number on it.

10 Q Now, I was wondering, from  
11 your prepared statement, it appears that it takes quite  
12 a lot of training to become an effective enforcement  
13 officer. How long would it take to train a new man?

14 A Well, that depends on how  
15 you go about training them. You know, you could do it  
16 the way the R.C.M.P. does, where you put them into  
17 intensive training for something like six months. That  
18 would be quite adequate, but when you're dealing with  
19 a small staff such as we are on a very limited budget,  
20 we find that it's much more practical to bring the  
21 person on, and put him out in the field with a trained  
22 officer, and to give them short courses in the specific  
23 areas that we need right away, and we try and keep this  
24 training going as a continuing sort of program.

25 One of the problems with our  
26 type of enforcement is that we don't get involved in the  
27 volume of cases as what, say, an R.C.M.P. officer would  
28 and so you have to be constantly brushing up on the  
29 theory of it if you're going to be effective in a courtroom.  
30 That's really the biggest problem that I have with  
training. We try to handle that through special courses



~~John Smith~~  
Cross-Exam by Evans

1 that are provided by institutes like Lethbridge Community  
2 College, N.A.I.T., Vancouver Police Academy; and at the  
3 same time we run our own seminars periodically where we  
4 bring in training people from these institutes, from the  
5 R.C.M.P. and from whatever other sources are available.

6 Q So it would take a  
7 considerable period of time to turn a new recruit into  
8 an enforcement officer.

9 A Well, it's a never-ending  
10 process really.

11 Q Now, on page 19 you  
12 discussed alternate power sources, with respect to  
13 seismic operations. Now, how -- and I think you stated  
14 you've tried to encourage the industries to use these.  
15 How effective have your efforts been?

16 A Well, in the Beaufort Sea  
17 area, it has been very effective in that a lot of the  
18 offshore, and I refer to the deeper offshore seismic,  
19 is presently being done during the summer months with  
20 airguns. In the high Arctic, there is a problem of  
21 access, you know because of ice cover, but there are  
22 a couple of ships every year that do work up through  
23 those areas, Lancaster Sound and into the high Arctic  
24 Islands, with air guns, so I think industry has tried  
25 as much as they're able to, with the technological  
26 limitations on them, to comply with that --

27 Q Do they get effective  
28 results with these airguns?

29 A Well, again, this is a  
30 technical opinion, but as I understand it, they're not





H.R. Trudeau  
Cross-Exam by Evans

as good as what the geogel is, but they're adequate in most areas. In some areas they have proven to be totally inadequate, and in those areas they've requested to go back with different methods.

Q Just out of interest, towards the bottom of page 9 you refer to a sparker and a wire exploder, and I wondered if discharging large amounts of electricity into the water would -- would this electrocute some of the fish?

A Well, I'm sure it would if they were in the immediate area of the discharge, but that system has never been used up here, to my knowledge.

Q It hasn't, eh?

A I don't know anything about most of these -- well, pardon me, vibroseis has been used, and dynoseis has been used, and vaporshock has been used, but not to any extent, and industry has discounted them for use in the offshore. The reasons are technical and I really couldn't relate.

Q Essentially, that they don't yield effective results?

A That's right.

Q Now, on page 26, in discussing enforcement, you stated that you were advised then that "I could not take legal action against a Crown corporation." I assume this was advice from the the Crown counsel's office in Yellowknife?

A That's right.

Q Did they tell you that





H.R. Trudeau  
Cross-Exam by Evans

1 they couldn't prosecute the Crown corporation, or that  
2 they as a matter of policy, wouldn't prosecute?

3 A No, I don't think it was  
4 a matter of policy. My communications with the Crown  
5 attorney's office, I've always found them to be quite  
6 willing to prosecute any cases that we brought to them,  
7 that were well prepared. As I understand it, there is  
8 some kind of protection built into the enacting  
9 legislation, that sets up the corporation, that provides  
10 for them some sort of immunity. Now, I haven't  
11 investigated that further myself, and that's my  
12 understanding of it.

13 THE COMMISSIONER: Well, there's  
14 no reason why you should have. You take the advice  
15 of the lawyers, and that's the end of it.

16 A Yes. Mind you, I'm not  
17 totally in agreement with it. I'm not sure that it  
18 couldn't be done, but --

19 (LAUGHTER)

20 I didn't drop it there.

21 Q Well, I assume that you'd  
22 like to see the legislation changed, so that these  
23 regulations could be enforced against Crown corporation  
24 is that correct?

25 A Well, what I would like  
26 to see is the same standards apply to everybody.

27 Q Well, exactly, that's  
28 what I'm --

29 A By whatever means.

30 THE COMMISSIONER: I think we



can interpret that.

Q I won't restate it for him in a different manner. I don't have any further questions Mr. Commissioner.

THE COMMISSIONER: Thank you.

CROSS-EXAMINATION BY MR. GIBBS:

Q Mr. Trudeau, on page 3 of your prepared evidence, you use some words which seem to me probably represented your philosophy as an enforcement officer. Towards the bottom of the page, the last full paragraph, you use these words, "realistic conditions attached to land use permits, which will permit the best use of resources with minimal environmental effects", and that really does represent your approach to the seismic activity, doesn't it?

A Yes, that's right.

Q I take it from your prepared evidence that this standard has been or is rapidly being achieved, insofar as you are concerned.

A Well, I think that if I read it properly, you know I mean I'm referring to the attitudes of other people that I'm associated with in this area that this is a recognized goal of those people, but how fast it's being achieved I'm not too sure.

Q Well, you certainly -- there were -- and no one discounts there were problems before --

A Oh absolutely.





1 Q -- but they have been  
2 reduced considerably by reason of the activities of you  
3 and your people.

4 A Yes, and I restrict that  
5 comment though to the areas that I am most familiar  
6 with, and that's the effects of these operations on the  
7 fisheries resources.

8 Q On page 5, for example, you  
9 talk about the problems of blocking streams, and bank  
10 erosion, and say that the situation is in your view, now  
11 being rectified.

12 A Yes. Again, I'll have to  
13 qualify that. I don't like qualifying statements all the  
14 time but it seems to be the way that these things have  
15 to be done. When I say that it's been rectified, I'm  
16 looking at it from the terms of an enforcement officer,  
17 again. You know, what we strive for is the best  
18 possible degree of compliance, given a certain amount  
19 of effort in the field of enforcement. Now, ideally of  
20 course, we would like to have 100% compliance, but  
21 realistically that probably won't be achieved, so given  
22 the amount of effort we put into it, I think we've  
23 achieved what is probably the best rate of compliance.  
24 Now, we could put a lot more effort into it, but I don't  
25 think the increase in compliance rates for that amount  
26 of effort would be justified.

27 Q But as an enforcement  
28 officer, you're satisfied that the problems of bank  
29 erosion and the blockage of streams, are now in hand.

30 A Yes, I would think so.





H.R. Trudeau  
Cross-Exam by Gibbs

1 Q And similarly, with fuel  
2 spills and improper waste disposal, you say on page 6  
3 that "a vast improvement in handling procedures for  
4 these materials has been evident over the past few years".

5 A Yes. But I also pointed  
6 out though that there are still spills every year,  
7 and situations where these enter the water, and in a  
8 very few of those cases, it's been our finding that they  
9 were attributed to negligence, and in those cases we've  
10 prosecuted the companies involved.

11 Q Yes, and that's what you  
12 as an enforcement officer expect is going to happen, as  
13 long as we live in an imperfect world, we're going to  
14 have some employment in your field.

15 A That's right. I hope so.

16 (LAUGHTER)

17 Q As long as you have, I  
18 guess I have <sup>so</sup> I hope so too. But in general, the question of fuel  
19 spills and improper waste disposals is under control.  
20 You have to prosecute sometimes, but --

21 A That's right.

22 Q And also, fish killed by  
23 explosives is now fairly well under control. You have  
24 to prosecute again some offenders, but you've  
25 instituted procedures that minimize the damage to the  
26 fish.

27 A Yes.

28 Q And then sir, considering  
29 those three aspects, the erosion, the stream blockage,  
30 the damage to fish, the spills, and waste disposal; all



of those are now under control, within the limits of the forces you have at your disposal.

A Yes, and I would say in the western part of the Arctic. As I said before, we don't have anybody in the eastern part, so you know I won't include that area in it.

A That's right.

Q And like Mr. Monaghan,  
Mr. Trudeau, you I take it, have no evidence that  
seismic or seismic related activities have significantly  
reduced the total populations of either fish, aquatic  
mammals or aquatic birds?

A      No, we haven't.

Q Nor do you have any evidence that seismic or seismic related activities have caused any permanent change in the habitat of any fish, aquatic mammals or aquatic birds?

A Yes, that would be corre

MR. MARSHALL: Those were most of my questions, too, sir. but I do have a couple of others, it'll be very brief.

CROSS-EXAMINATION BY MR. MARSHALL:

Q Mr. Trudeau, page 17 of your evidence you were talking about impact on seals of explosives. Have you got that section in your evidence?





1 A Yes.

2 Q You say near the bottom  
3 of the middle paragraph,

4 "From a 50 pound charge of 60% geogel, only one of  
5 the animals had any outward sign of injury. The  
6 animal, at the 50 foot station, developed a nose  
7 bleed , following the blast, but post mortem  
8 examination did not indicate that the injury was  
9 serious and it was felt that the seal would have  
10 recovered."

11 A And you're going to ask  
12 me about the postmortem .

13 Q Well, do I understand this  
14 correctly -- that you dispatched the seal to do a post-  
15 mortem to see if he would have died of a nose bleed?

16 (LAUGHTER)

17 A That might be a slight  
18 over-simplification of it. Actually, what they do, is  
19 they do dispatch the seals, but not specifically to find  
20 out whether he would have died from a nosebleed. As  
21 was indicated in the evidence dealing with fish, the  
22 turmoil that results inside the fishes is quite massive,  
23 but on the outside of the fish there is no indication  
24 of anything wrong, so the only way that you could  
25 determine with the seals or with the fish, as to what  
26 the results of that explosion was on the animal, would  
27 be to open him up and find out; whether he had internal  
28 hemorrhage, whether the liver was ruptured, and this  
29 sort of thing. Not only the animal with the nosebleed  
30 was dispatched and examined, they were all done that way.



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1 Q I see.

2 THE COMMISSIONER: You wanted  
3 to see if there wasn't something rather more serious  
4 than a nosebleed.

5 A That's right, yes.

6 Q I was really wondering  
7 whether you had any recommendations as to how we can  
8 control the activities of animal pathologists?

9 Mr. Trudeau, you have a lot  
10 of experience with the use of explosives, particularly  
11 as they relate to seismic activities, as you discussed  
12 in your evidence; but I take it that would relate  
13 generally to the use of explosives and the control of  
14 the use of explosives as they might affect fish resources  
15 in the area within your jurisdiction?

16 A Yes, that's right.

17 Q I wonder, sir, if you have  
18 any recommendations that you might wish to make that  
19 would specifically relate to blasting that might be  
20 required for stream crossings of pipelines. Have you  
21 given consideration to mitigative measures that might  
22 be taken, or adaptations to techniques that might be  
23 of assistance in minimizing the impact of any such  
24 operations on fish resources in the Territories?

25 A Well, generally, I would  
26 like to see no blasting take place in those conditions.  
27 That may not be realistic though. The only -- you see,  
28 the trouble with explosives is that they do cause a  
29 great deal of damage to the immediate area, and dealing  
30 in a closed system like a stream; a very confined





1 system, it's almost certain to cause total mortality  
2 within the local area of the blast. The only thing that  
3 comes to mind, offhand, would be to time that type of  
4 activity to avoid major migrations of fish through  
5 streams. That's about all that comes to mind offhand.

6 Q This would require  
7 monitoring of the particular stream to make sure say  
8 that migrating fish had left the area before blasting  
9 were to take place?

10 A Yes, that's right, sure.

11 Q Have you any recommendations  
12 about any possible way of scaring fish from an area,  
13 prior to blasting operations?

14 A Well the reports that I  
15 have available indicated that the fish are not frightened  
16 away from the area of a blast, and that in fact some  
17 of them may be attracted to the area by the fact that  
18 there are injured and dead fish floating around or  
19 floundering around in the water.

20 Q You are referring there  
21 to the use of an explosive to scare them off?

22 A That's right.

23 Q I was wondering if there  
24 might be some other techniques that you're familiar  
25 with.

26 A No, there's nothing that  
27 I'm aware of. My own observations of fish, you know  
28 I've done some skin diving, and my own observations of  
29 fish would indicate that when you frighten a fish it'll  
30 dart away for a very short distance, and then it'll stop



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1 and in most cases turn back. I think probably it would  
2 be very difficult if not indeed impossible to frighten  
3 them any appreciable distance away from a given area,  
4 unless you were making one very concerted effort to do  
5 it. I don't even know how you would do it.

6 MR. MARSHALL: Fine, thank you  
7 sir. Those are all my questions.

8 CROSS-EXAMINATION BY MR. GOUDGE:

9 Q Mr. Monaghan --

10 THE COMMISSIONER: Excuse me,  
11 that's Mr. Trudeau.

12 Q -- or Mr. Trudeau, sorry,  
13 let me begin if I may by asking you about some -- your  
14 responsibilities concerning the control of industrial  
15 activities. As I understand you as of 1971, the fisheries  
16 people began to control industrial activity that might  
17 affect fish resources.

18 A Yes, but I would qualify  
19 that word "control". Our control in most cases was in  
20 the form of communication with these companies. It took  
21 more of a form of an educational process than a strict  
22 enforcement one, although there were a couple of instances  
23 where we did have to prosecute, where the best efforts  
24 failed, and that was the last resort.

25 Q Well, was it approximately  
26 in 1971 when industry began the practice of submitting  
27 its plans for future activities to the Fisheries Service  
28 where fishery resources might be affected?

29 A That's right.

30 Q And I take it that's in





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1 the nature of a permitting or licensing function?

2 A Well, yes. We started  
3 into a system of our own, initially. We did draft up  
4 a set of guidelines which required industry to submit  
5 plans to our Service, and those were in fact distributed  
6 to industry, but then right following that, the Indian  
7 Affairs Department came out with their Land Use Act,  
8 and negotiations with them resulted in the formation of  
9 the Land Use Advisory Committee; so now we then withdrew  
10 our requirements for a submission of plans, and we  
11 simply participated in the Land Use Advisory Committee;  
12 so we still get them all, but we get them through them.

13 THE COMMISSIONER: They impose  
14 the requirements you would have, if you had gone with  
15 your own procedure.

16 A That's right.

17 MR. GOUDGE: Are they using  
18 the 1971 guidelines that you had developed for your  
19 separate process?

20 A Well, either that or a  
21 modification of them, yes.

22 Q Those guidelines, I take  
23 it from what you say, have been kept current?

24 A Yes.

25 Q Are they available?

26 A The guidelines?

27 Q YES.

28 A Well, I've got a copy of  
29 the initial guidelines that we drew up. That wouldn't  
30 be a current reflection of the type of conditions that



1 go into a Land Use permit, however. Those would be  
2 available from Indian Affairs, and I could let you have  
3 a copy of the guidelines, if that's what you're interested  
4 in.

5 Q I'd be grateful if you'd  
6 leave that with us. Now sir, I take it then, that the  
7 Fisheries Service involves people who are both reviewers  
8 of applications, if you will, for Land Use permits, and  
9 policemen, fisheries officers?

10 A That's right.

11 Q In connection with the  
12 policing function, does the fisheries officer inspect  
13 each project that has conditions relating to fisheries  
14 and fisheries habitat attached to it?

15 A Well, given the limited  
16 manpower we have, we try to do that. I wouldn't  
17 guarantee that we do in fact cover every program.

18 Q Yes, obviously you'd  
19 like to but your manpower constraints may prevent it.

20 A That's right.

21 Q What about a monitoring  
22 function. Is there any monitoring function in the  
23 Fisheries Service that can evaluate the effectiveness  
24 of the fisheries conditions attached, with a view to  
25 possible changes in those conditions if they're not  
26 achieving the desired result?

27 A Well, the monitoring I  
28 would suggest, is done at the same time that the  
29 patrolling is done. Well, depending on what particular  
30 aspect you're looking at, in the case of stream crossing





1 for instance, you know, we try to make an initial  
2 patrol over a seismic operation, make sure that the  
3 stream crossings were put in properly in the first place,  
4 make contact with the party manager or whoever's in  
5 charge of the operation, and make sure that he clearly  
6 understands that he is to remove all of those crossings  
7 prior to leaving the area. Then we try to make a  
8 follow-up of that program to ensure that in fact he has  
9 done that. One of the problems there being that usually  
10 these operations run to the spring, and then all at  
11 once all of these operations terminate at once; and with  
12 one man basically covering all of that, I can fairly  
13 well assure you we don't get them all.

14 Q But as part of your  
15 inspecting circuit, is it possible for the fisheries  
16 officer to engage in a type of monitoring function so  
17 that he can evaluate the effectiveness of the pre-imposed  
18 conditions, in achieving the results you want?

19 A Well, to a limited extent,  
20 yes.

21 Q Yes. But that's desirable  
22 I take it --

23 A It is desirable, certainly.  
24 But there are problems, you know. If you take for  
25 instance the explosive work done in the winter time,  
26 you can monitor it constantly, but when you're working  
27 under ice, it's pretty hard to determine what the  
28 effects are. We've tried to do it from the point of  
29 view of monitoring pressures generated, but we have to  
30 rely on industry to do the technical recording of those



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1 pressures, and to do it constantly is quite an added  
2 cost to the operation, so what we try to do rather than  
3 do it constantly is to hit them periodically, and ask  
4 them to take recordings on the next couple of shocks  
5 or something like that.

6 Q Yes, I understand the  
7 practical constraints. It's the theoretical goal to be  
8 achieved that I'm interested in, and you agree I take it  
9 that monitoring --

10 A Is desirable.

11 Q Yes.

12 Now, you've said that your  
13 operations have now merged with the Land Use Program,  
14 I wonder whether the inspection -- I take it from your  
15 answers that the inspection now undertaken is done by  
16 your people, where fisheries matters are concerned, so  
17 that there would be in those cases at least two  
18 inspections, one by the Land Use people, and one by your  
19 people?

20 A Well, what we try to do is  
21 coordinate our efforts with the Land Use people. We will  
22 inspect one program, they may be on the same day  
23 inspecting another program, and we report to each other  
24 our findings in the other's jurisdiction.

25 Q I see. So that you don't  
26 engage in the practice of having double inspections of  
27 the same project, one with people of your skill and  
28 another with people of the Land Use skill.

29 A No, we try to avoid that.

30 Q Why do you avoid it? Isn't





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1 it two different specialties?

2 A Yes, it is, of course, but  
3 the costs involved are quite great when you're talking  
4 about chartered aircraft, and so if you want to get the  
5 best coverage with the given amount of money, it's better  
6 to try and get cooperation between the two.

7 Q So once again, you made  
8 a trade-off of economics as against the optimum  
9 inspection practice?

10 A Yes.

11 Q Now, I understood from your  
12 evidence that there are some activities that your Service  
13 presently regulates, apart from Land Use operations. For  
14 example, the underwater blasting.

15 A Yes, that's right.

16 Q Are there any others that  
17 are separately regulated by the Fisheries Service, besides  
18 underwater blasting?

19 A You're thinking particularly  
20 of land use type operations?

21 Q No, I understand all the  
22 land use operations and the way they're regulated where  
23 they involve your --

24 A Well, our Service is  
25 responsible for enforcement of all of the -- well, of the  
26 Fisheries Act, all of the regulations that are issued  
27 pursuant to that act, which would include the N.W.T.  
28 Fishery Regulations, involving commercial, domestic and  
29 sports fisheries, all of the marine mammal regulations,  
30 the Ocean Dumping Act, which has recently come out, is



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1 also going to be part of our responsibility now.

2 Q What is the Ocean Dumping  
3 Act?

4 A Well, as I say, it just  
5 came out; I'm not very familiar with it.

6 Q But as far as industrial  
7 activity and your involvement with it is concerned, it  
8 would fall under either the Land Use Permit function,  
9 or the blasting underwater function.

10 A Or the Arctic Waters Oil  
11 and Gas Committee, as well. They work under the Arctic  
12 Waters Pollution Prevention Act, which is separate from  
13 the Land Use section, but we are involved in that as  
14 well.

15 Q Who else is involved in  
16 regulating activities under that act, the Arctic Oil and  
17 Waters?

18 A Well, on that committee,  
19 there's representatives from the Environmental Protection  
20 Service, Canadian Wildlife Service, Ocean and Aquatic  
21 Sciences, well, Department of Indian Affairs, of course,  
22 and the various departments represented by that department.  
23 They are the chairmen of that committee. Oh yes,  
24 Ministry of Transport is also represented.

25 Q And I take it then the  
26 methodology used in that kind of regulation would be  
27 of the same general form as the Land Use Regulation  
28 operation? Application for permit, approval, and  
29 inspection?

30 A Yes.





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1 Q Yes. Now dealing specifically  
2 with your permits for underwater blasting, can you tell  
3 me whether these are inspected in every case, or does  
4 your budget prohibit that?

5 A We try to cover every one  
6 of those, yes.

7 Q And once again, if the  
8 budget allows, you would like to have a monitoring  
9 function associated with that, as well?

10 A Well, we would like to  
11 have a constant monitoring of those kind of operations  
12 during the summer, when there would be a good chance of  
13 really assessing the effects of it. During the winter  
14 though, I don't think you would learn enough from a  
15 constant monitoring program to really warrant that sort  
16 of expense.

17 Q Now, on page 8 you refer  
18 to a particular type of blasting underwater, and the  
19 standards that you have used in certain small delta  
20 lakes. You said that you've permitted, as I understand  
21 you, certain blasting activities where in small delta  
22 lakes there may be no fishery concern or no use of the  
23 resource by native peoples. Those are two of the  
24 standards you apply as I understand it. Is that so?

25 A Yes. I might point out  
26 there that as I stated earlier on, our general attitude  
27 towards blasting in lakes and rivers is that we do not  
28 permit blasting at all. Now, in these particular  
29 situations, and if you look around the delta, you'll  
30 see there's a lot of these little lakes that don't



1 contain fish at all, they're just small bodies of water.  
2 Now we may not know for a fact on any given lake whether  
3 or not there is any fish population in it, however we  
4 don't permit them to shoot in them anyway unless we  
5 either know for sure, or else we make them comply with  
6 this depth requirement. Now we feel quite confident that  
7 with the depth requirement that we impose on them, even  
8 if there is a fish population, the effect will be  
9 minimal.

10 Now, as I state, that is not  
11 a certainty of course, and so we do try in those cases  
12 to follow this up and to determine in the spring, after  
13 the thaw, whether or not there has been any fish killed.  
14 We have not yet detected anything like that.

15 Q So in establishing that  
16 there are no fisheries concerns, and therefore blasting  
17 can go ahead without observing the depth requirement.

18 A No, we wouldn't come to  
19 that conclusion based on say one winter's operation, and  
20 subsequent follow-up. If they applied to do it again  
21 on the same lake the next year, they would still be  
22 required to comply with the depth requirements.

23 Q I see. Now how do you  
24 come to the determination in specific cases that small,  
25 certain small delta lakes for which applications are  
26 made, are not used by native peoples?

27 A Well, we have a fishery  
28 officer stationed here in Inuvik, and whenever I get  
29 an application of that sort I just contact our officer  
30 here, and he makes the appropriate inquiries, through



1 the communities.

2 Q It would be a matter of  
3 consulting with the communities, to have --

4 A Or based on his experience  
5 He may know, without having to go in there, that certain  
6 lakes are not used.

7 Q So it isn't a necessary  
8 prerequisite when this standard is being applied, that  
9 there be a particular consultation with the community  
10 if the officer has prior experience?

11 A That's right.

12 Q Now, as I understood you  
13 when you spoke of your early entry into the field of  
14 regulating blasting underwater, you proceeded with great  
15 caution because of the uncertainty factor?

16 A That's right.

17 Q And I perhaps, unlike Mr.  
18 Gibbs, drew from that portion of your evidence, rather  
19 than the portion he referred you to, your general  
20 philosophy of regulation. Is it fair to say that your  
21 general philosophy of regulation is reflected in the  
22 way you approach the early regulation of blasting  
23 underwater. Where you were very cautious because you  
24 were uncertain of the effects which might result?

25 A Well I think, ideally,  
26 you know, like any enforcement officer, I would like  
27 everything to be black and white, you know, either you  
28 can or you can't, you know; that's the easiest way to  
29 enforce something. However, we are faced with  
30 regulations that when drafted didn't address the specific





1 problems that we're facing today, and this is a good  
2 example of one, so in this case it may not be the way  
3 that I would like to do it necessarily, but it seem  
4 me like the best way to do it under the circumstances.

5 Q Yes. You say on page 7  
6 for example that you tried to base your decisions -- to  
7 bias your decisions on the safe side, in dealing with  
8 lakes and streams, and in most cases you simply refused  
9 to authorize the use of explosives in these systems  
10 until you knew more about them, and the implications of  
11 such programs on them. I take that to reflect your  
12 regulatory thinking. Is that fair?

13 A Yes, that's right, yes.

14 Q You presumably would like  
15 to get into the position of knowing exactly what the  
16 impact of the proposals would be, but until you get there  
17 you have to correct on the cautious side.

18 A That's right.

19 Q And presumably there are  
20 certain cases, and you refer particularly, I think, on  
21 page 18, to certain effects on seals who may be under  
22 stress. That may be an example of a general category  
23 of case where research may never be able to tell you  
24 what the effect of a proposed activity will be. Is that  
25 so, there is that category of case?

26 A Yes, that's right.

27 Q And when that category of  
28 case exists, regulation of the activity concerned will  
29 always have to err on the safe side?

30 A Well, that'll always have



1 to be taken into consideration.

2 Q Yes. And will result in  
3 what might prove to be, should research be able to  
4 answer the questions, over-cautious regulation.

5 A Yes.

6 Q Now, from your general  
7 experience as a regulating officer, is this a philosophy  
8 that is shared by other regulating agencies that you've  
9 had contact with?

10 A Well, I'd rather not  
11 answer that. I'd prefer you ask the other representative  
12 of those agencies.

13 Q On page 8 you refer to  
14 a specific example which Mr. Evans asked you about,  
15 where you in fact went from rather looser restrictions  
16 concerning depth of under bottom burial, to rather  
17 tighter restrictions as time passed. Is that correct?

18 A Yes, that's right.

19 Q And I take it this is  
20 an example which runs in some sense counter to your  
21 general regulating philosophy?

22 A Well, I'd explain though  
23 that the initial scale that was drawn up was drawn up  
24 by myself, and you know those figures were rather  
25 arbitrary, you know I accepted the principle that if  
26 you bury the charge, you're going to lower the pressures  
27 generated in the water, but I didn't have at that time  
28 anything I could refer to in the form of an established  
29 schedule, so that was drawn up just on my own logic,  
30 if anything else, so it wasn't too much of a surprise





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to me that it was changed later.

Q Yes, I understand that sir. I simply wanted to get and I think you've acknowledged that in <sup>some</sup> sense that example runs counter to your general regulatory philosophy.

A Yes, that's possibly true.

Q Now, as to the matter of enforcing blast -- these permits for blasting underwater, you say that on page 18, in cases where you have found evidence of fish kills, the operations were suspended.

A Yes.

Q Does this mean that the seismic projects were shut down, when that occurred?

A Well, not necessarily shut down for the entire program, but there was one operation that took place -- I'm working just from memory now, so I may not have all the facts right, but there was one operation that took place in the Eskimo Lakes area. We detected a fish kill on that, and we shut that operation down, and that resulted in the entire program being shut down, and as a matter of fact the company went bankrupt shortly afterwards. Whether that was part of it or not I don't know, but there was another one where we imposed these types of conditions on them. The company was unable to meet our requirements, and we would not relax them, and so they were unable to do that -- you know, the last part of their program.

So, it's not necessarily the total suspension of the program. If they, for instance, were approaching an area like the mouth of a river, for



instance, and we encountered a fish kill, we might tell them to shut down that portion of the operation, move off into deeper water, move off away from the mouth of the river, something like that.

Q Yes. But not necessarily a complete shutdown?

A It would depend on the circumstances.

Q Have you had any cases where you've required a suspension of operation due to observed fish kill when the operator has complied with all the conditions of the permit, and yet the fish kill has resulted?

A Yes, well, that was the case in the ones that I related. We issued a permit where we had the conditions on it, and we were allowing them to use linear explosives, but we did find a fish kill afterwards, so we stopped the operation; but that was clearly stated at the time we issued the permit that if we did encounter fish kill, we would suspend the operation.

Q I see. So it's in a sense a conditional permit?

A That's right.

Q You spoke in answer to my friend, Mr. Marshall, to the issue of blasting river beds for pipeline crossings. Do you have any views as to the desirability of blasting during ice-covered situations, or without ice on riverbeds?

A Well, it seems to me there



1 would be a lot of variables involved that would depend  
2 on whether the river was frozen to the bottom, whether  
3 or not the river was one that was utilized by fish for  
4 migration route or for spawning purposes, whether there  
5 is a chance that there might be spawn on the bed at the  
6 time, you know, the timing of it would have to be  
7 specific to the stream crossing that you're working on,  
8 I think.

9 As a general proposition  
10 would you agree that blasting under ice causes greater  
11 shocks than blasting where there's no ice cover?

12 A Well, I think that may be  
13 a possibility, but I don't have any evidence of that.

14 Q Now, as to land seismic,  
15 you make reference in your operations relating to land  
16 seismic control to the requirement that operators remove  
17 snow and ice crossings.

18 A That's right.

19 Q And you say on page 5 that  
20 it is part of your function or your officers' function  
21 to remind the operators of this requirement.

22 A That's right, yes.

23 Q Do you build this in as  
24 a separate stage in the regulatory process, so that we  
25 now have a sequence that begins with permitting and then  
26 goes through a reminding stage, and then to an inspection  
27 stage?

28 A No, there's no requirement  
29 on us to remind them of anything. If it's a condition  
30 of the permit, then they are obligated to do it, but --





Q So you remind in certain cases, where it seems easy to do and advantageous to do, but it isn't an automatic thing?

A That's right. And it's not entirely done by us either, you know, the Land Use inspectors do it as well.

Q Yes. And once again, on the same principle, on a kind of ad hoc basis without making it a regular part of your regulatory procedure.

A YES.

Q And I take it in this particular case the reason for doing it is because of the highly critical timing of the removal of such crossings?

A That's right.

Q I take it if you remove them too early, it may disturb over-wintering fish.

A No, if they remove them early there's no problem, but the problem results in trying to work right to the end of the season, and then not having enough time to come back before the spring floods .

Q So the problem is not on the early side, it's on the late side --

A On the late side, that's right.

Q Now, on page 6 you referred to the operations that you're getting into under the title, I suppose, of "Pollution Regulation". In your experience, this I understand has been focused mainly on



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1 spills. The polluting incidents that you've been  
2 regulating relate primarily to spills.

3 A Well, I should probably  
4 point out though, that within the Department of the  
5 Environment, the responsibility for administration of  
6 that section 33-2 has been given over to the Environmental  
7 Protection Service, and in the Northwest Territories,  
8 because they don't have an enforcement arm, and I think  
9 this is probably true on the west coast and the east  
10 coast in remoter areas as well; we do the enforcement  
11 for them. So they are involved in research and development  
12 of techniques, and you know the technical aspects of  
13 pollution control and research, and we do the enforcement.

14 Q Yes. In relation to these  
15 spill incidents which you've recited which resulted in  
16 prosecutions, can you tell us the results of the  
17 prosecutions? Do they fall within the general fine levels  
18 you spoke about later on?

19 A They ranged from 2,000 to  
20 \$10,000.

21 Q Has it been your practice  
22 to take advantage of any other regulatory penalties,  
23 in connection with polluting incidents? Have you used --

24 A Such like as an injunction  
25 or something?

26 Q Well such as injunction  
27 or shutting down an activity?

28 A Not in the cases that we've  
29 been involved with. There is a possibility of that  
30 in the Fisheries Act, but we haven't utilized it.





Q Is there anything peculiar about spills that make prosecution the best regulatory mechanism as opposed to shutting down the activity?

A Well, there's probably a question as to whether or not we would have the authority to shut down an operation. Depending on what kind of an operation you're talking about. A spill is usually something that results in a staging area, you know, that sort of thing, so there's really nothing to shut down. Everything is there already, so you know, what can you shut down?

In those cases we've investigated them and we've found you know, various reasons that have contributed to the ultimate spill. Most cases we've found that it was really negligence or calculated risk that was taken by the operator in establishing a staging area in the first place, and so on that basis we prosecute. But there was really nothing that we could have shut down. Does that answer it?

Q Yes it does, I take it that you feel the enforcement mechanism you have been using, the prosecution mechanism, must be continued, but let me ask you whether you think in general terms, the prosecution mechanism is as effective in controlling or determining activity on the part of the operator as shut down.

A No, I view prosecution as a last resort in most cases. Initially we try to educate the operators to implement environmental controls in their operations, to prevent the problem from



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1 happening in the first place. It's only in cases where  
2 we find that operators have chosen to take a risk, and  
3 as a result a spill has occurred, and as a last resort  
4 then really the only option left to us is prosecution.

5 Q But you say that shutdown  
6 is not open to you because of the fact that there is  
7 in those cases nothing to shut down, is that your answer?

8 A Well, yes , but that could  
9 be the case yes. I mean, there are other cases for  
10 instance, I don't want to single out any operator, you  
11 know, because I don't want --

12 Q No, and I'm not asking  
13 you to, but perhaps you could give us an example  
14 without talking about the names.

15 A Okay, a class of offence  
16 that may occur, for instance, a spill resulting  
17 from a mining operation. We could, in that case, try  
18 to seek a shutdown order, you know, through the proper  
19 court procedures; and the provision for that is in the  
20 Fisheries Act. So, we could do that, but you know, that  
21 is a pretty severe way of approaching it. Now, if we  
22 can get the operator to rectify the situation, in other  
23 words stop the leakage or spill or what have you, and  
24 impress upon him that this is not an acceptable  
25 procedure, neither to us nor to the public at large,  
26 then I think we've achieved the purpose, without having  
27 to go to the severest form of penalty --

28 Q Which would be either  
29 shutdown or prosecution?

30 A No no, I would go through



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1 the procedure of prosecution, but I wouldn't seek a  
2 shutdown unless it was warranted.

3 Q I see.

4 Now, you've said to us that  
5 your department engages in the regulation of fishing as  
6 well as industrial activity that may affect fish; and  
7 you've said that you anticipate the need to expand your  
8 staff to deal with game fishing if a pipeline were  
9 built. I wonder if you have given any thought to any  
10 additions that may be needed to the regulations that  
11 your staff administer, if a pipeline is built? Let's  
12 begin with the game fishing threat that may result from  
13 the construction of a pipeline.

14 MR. GIBBS: I think he said  
15 the game fishing threat came from the construction of  
16 roads, not from the construction of a pipeline.

17 MR. GOUDGE: Well, let me ask  
18 you whether you think there would be an increase in your  
19 activities concerning game fishing, given the construction  
20 of a pipeline?

21 A Yes, well the threat to  
22 the fishery would come in the numbers of people  
23 associated with that kind of an operation, so as these  
24 people are put into areas where they have access to  
25 relatively small fisheries, I can see problems in that  
26 local area. I could foresee problems, rather.

27 We've given some thought to it,  
28 particularly in relation to the highway, but I think the  
29 same sort of problems would relate to the same type of  
30 situation with construction of a pipeline, and it has been





H.R. Trudeau  
Cross-Exam by Goudge

1 proposed, I understand, that the companies involved  
2 in the construction activities will prohibit their  
3 people from fishing, from sports fishing. I don't know  
4 if that's necessarily the way to do it. I think we can  
5 though respond very quickly in regulation form by  
6 adjusting catch and possession limits, by --

7 Q I'm sorry, what was that?

8 A By adjusting catch and  
9 possession limits --

10 Q Yes.

11 A -- by closing down section  
12 of streams for protection of spawning fish, you know,  
13 we're able to respond fairly quickly in that area. So  
14 we've been looking at this for some time, and we  
15 anticipate having to do things like that when the time  
16 comes.

17 Q What about the use of  
18 barbless hooks, is that a device of any merit, as far  
19 as you're concerned?

20 A Well, our service did a  
21 study on the use of barbless hooks, and surprisingly  
22 enough, it did not indicate that the barbless hook  
23 is any less lethal to the fish than the barbed hook.  
24 This was done only with trout, by the way, so that  
25 doesn't necessarily mean the same thing is true with  
26 other fish.

27 Q By "any less lethal" I  
28 take it you mean it didn't reduce catches?

29 A Injurious, I should say.

30 Q It didn't reduce catches?



H.R. Trudeau  
Cross-Exam by Goudge

1                   A     No, well we weren't worried  
2     about whether it reduced catches, but the thing is when  
3     you catch a fish with a barbed hook, and you rip the  
4     hook out of the mouth, if the barb is on it, it tears  
5     up the lining of the mouth, and whatnot. What we did  
6     was just caught a lot of fish with barbed and with barbless  
7     hooks and then took the hooks out, and mind you these are  
8     fishery biologists doing this so they handled fish  
9     probably a little more gently than would the average  
10    angler, but then we retained the fish in pens to observe  
11    the results of that kind of an operation and there was  
12    no difference between barbed and barbless hooks.  
13    But again, I say, that's only with trout.

14                   Q     Now, getting away from the  
15    game fisheries, in fact, would you see the construction  
16    activities connected with the major pipeline such as  
17    the two proposals we're dealing with, as having an  
18    increased impact on the fisheries resources that you  
19    police presently?

20                   A     On the fisheries resources?

21                   Q     Yes.

22                   A     In terms of numbers?

23                   Q     Yes. The construction  
24    activities.

25                   A     Well, I don't know if  
26    I could answer that. That would be a rather complicated  
27    question and you'd have to look at stream crossings and  
28    everyone would be specific to the population you're  
29    dealing with.

30                   Q     Yes. Have you given any





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1 thought to the way in which the Fish Service inspection  
2 process will dovetail with the construction activities  
3 of the pipeline?

4 A Well of course now, I  
5 don't know how or if when this pipeline does begin  
6 construction, how it is going to be regulated, what  
7 sort of an agency responsibility there will be. As I  
8 see it I don't think it's desirable to have several  
9 different agencies with separate enforcement personnel  
10 working on the same sort of problems. You know, it  
11 seems to me a coordinated approach to it would be  
12 desirable. Until such time as I know how that is going  
13 to be done, I don't really know how I will respond to  
14 our particular concerns.

15 Q Mr. Trudeau, are you  
16 familiar with the publication called "Guideline For The  
17 Protection Of The Fish Resources Of The Northwest  
18 Territories During Highway Construction And Operation",  
19 by Messrs. Dryden and Stein?

20 A Yes, I'm familiar with  
21 it, but I don't have a copy handy, for reference.

22 Q I just wonder whether  
23 this document is used in your policing and inspecting  
24 service in any way, and if so how?

25 A Well, all of the publications  
26 that come out of the Freshwater Institute are distributed  
27 to our officers so they're basically aware of those  
28 types of things, and in conducting their regular patrol  
29 operations I would expect that the, you know, the  
30 concerns in there would be reflected in their approach.



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Cross-Exam by Goudge  
Cross-Exam by Evans

Q So a document like this serves as really an educational tool for your officers, in assisting them to enforce the particular permits

and in assisting them to enforce the particular permits

A Yes.

Q Sir, those are all the questions I have.

MR. EVANS: Mr. Commissioner, with your permission, I have a couple of more questions I'd like to address to this witness.

THE COMMISSIONER: Okay.

CROSS-EXAMINATION BY MR. EVANS (CONTINUED):

Q Thank you. Now, are you a member of the Arctic Waters Oil and Gas Advisory Committee?

A Yes, I am.

Q How about the Land Use Advisory Committee?

A Yes, that's right.

Q So you're familiar with their operations. Now, I wonder, do these committees work under the detailed terms of reference, or only general guidelines?

A Well, there are detailed terms of reference, in the case of the Arctic Waters Oil and Gas Committee, however, I think those are still in the formulation stage. The Land Use Advisory Committee has definite terms of reference, yes.

Q Well, when one of these committees makes a recommendation to the Department of



Indian and Northern Affairs, what's its status, what's the status of the recommendation? Is it a binding order or merely a suggestion?

THE COMMISSIONER: Well, that's a question of law, isn't it? I think we understand that these are matters for the Minister, and he can make whatever arrangements he wishes to within his department to obtain appropriate advice. If Mr. Trudeau, who is not a lawyer, were to and is not appearing as an expert on the meaning of the Statutes of Canada -- were to give us his opinion, I don't think we'd be any further ahead, meaning no disrespect to him.

MR. EVANS: No, I realize that Mr. Commissioner. It's probably not very well phrased. What I'd really like to find out is what the general practice is, whether they make a recommendation and then DINA as a matter of course is required to follow it, or whether they just look at it, and make up their own minds.

THE COMMISSIONER: Well, Mr. Yates discussed the subject at length, and he is a senior official in Indian Affairs and Northern Development. I thought we went through this. Is there anything that you want this witness to shed some light on that Mr. Yates didn't discuss? I understand the procedure, unless I'm totally at sea. The Minister decides these things, and he can set up an ad hoc committee, or he can set up a permanent committee, seek their advice, tell them how to go about obtaining evidence, and then give their report whatever consideration he deems appropriate.





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1 MR. EVANS: Could I have just  
2 a minute, Mr. Commissioner?

3 MR. BAYLY: Not every decision  
4 made by the Land Use Advisory Committee goes to the  
5 Minister, and that may be the area of questioning that  
6 Mr. Evans is interested in. Who actually makes that  
7 decision? If he made all those decisions he wouldn't  
8 have time to do anything else, I expect.

9 WITNESS TRUDEAU: I can respond  
10 on the status of the advice of the members of the  
11 committee.

12 THE COMMISSIONER: Yes, well  
13 you help us out then.

14 A The members on that  
15 committee, both of those committees are advisory  
16 committees. The legislation that is being applied is  
17 administered by the Department of Indian Affairs. There  
18 are areas for instance, in some of the advice that I  
19 give to that committee, is clothed in the laws that I'm  
20 responsible for enforcing, so in effect, that isn't  
21 advice, I'm just making them aware of the fact that this  
22 is what the law requires.

23 But in many cases though, we  
24 do offer what is really advice. Now, it's I guess  
25 initially to the discretion of the chairman of that  
26 committee whether or not he wants to accept or reject  
27 that advice. In most cases I've found that you know,  
28 that every consideration is given to the advice tendered  
29 at those meetings. Now that doesn't mean that they'll  
30 always implement what we suggest should be implemented,



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1 but they'll certainly consider the advice. I don't know  
2 if that answers it, but --

3 MR. EVANS: Thank you. One  
4 other matter I wondered if you could clarify how the  
5 Environmental Protection Service and the Fisheries  
6 Marine Service coordinate their activities in enforcing  
7 the Fisheries Act?

8 A Well, in the Northwest  
9 Territories, as I said,, the staff at the Environmental  
10 Protection Service  
11 have, are for the most part, professional  
12 people, biologists, engineers, and this sort of thing.  
13 They are usually involved in the technical assessments  
14 of proposals and particular ongoing operations like  
15 mining operations and this sort of thing, and the  
16 enforcement is done by our officers in the field, when  
17 we encounter a violation under Section 33 in the field,  
18 the officer responds by collecting the evidence necessary,  
19 in consultation with myself we put the case together,  
20 and when we're prepared, if it should end up in a  
21 decision to go to court with it, we simply go down to  
22 the Environmental Protection Service and present them  
23 with this case, and on their advice we either proceed  
24 or we'll drop it.

24 Q Thank you, Mr. Trudeau.

25 THE COMMISSIONER: Any  
26 re-examination?

27 RE-EXAMINATION BY MR. BAYLY:

28 MR. BAYLY: Just one question  
29 arising out of the cross-examination of Mr. Gibbs.

30 Mr. Gibbs asked you  
31 whether or not there were any information that fish stocks





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Re-examination

1 or waterfowl or marine mammals <sup>have</sup> depleted as a result of  
2 seismic in lakes and streams, and you said that no that  
3 there was no information that they had depleted. Is  
4 there any information to the contrary, that they have  
5 remained constant?

6 A No, we have no documentation  
7 either way.

8 MR. BAYLY: Thank you. That's  
9 the only other question I had, and I have no further  
10 re-examination.

11 THE COMMISSIONER: Well, thank  
12 you very much Mr. Trudeau. We certainly appreciate  
13 your most helpful and complete presentation, and we've  
14 learned a great deal about the impact of seismic work  
15 on fish, and the enforcement measures that the government  
16 has taken. So, I'd like you to stay for a cup of coffee,  
17 and we'll adjourn now for coffee.

18 (WITNESS ASIDE)

19 (PROCEEDINGS ADJOURNED AT 11:15 A.M.)  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30



A.R. Milne

In Chief

(PROCEEDINGS RESUMED AT 11:45 A.M.)

THE COMMISSIONER: We will come  
order, ladies and gentlemen.

MR. BAYLY: Before we begin the  
cross-examination of Mr. Milne again, I have, in response  
to your request, a letter from Dr. Martell. You had  
asked him to review the literature and to comment and I  
have copies of that letter for all the participants.  
I'll file a copy of that letter as an exhibit and dis-  
tribute the other copies.

MR. EVANS: Mr. Commissioner,  
you asked Mr. Milne to read over Dr. Pimlott's evidence  
while he was away and I understand he's done so. Would  
you like him to comment on it at this time, or --

THE COMMISSIONER: Yes, I think  
that might be helpful. It's in the nature of further  
evidence in chief and so, welcome back, sir. If you  
would like to comment on Dr. Pimlott's evidence now,  
please go ahead in your own way.

ALLEN R. MILNE, resumed:

DIRECT EXAMINATION BY MR. BAYLY (CONTINUED):

WITNESS MILNE: I can make  
only one general comment, is that I found no points  
within his evidence which I could disagree with.

THE COMMISSIONER: Let me just  
asked you a couple of things that were on my mind.  
When was the program Dr. Pimlott referred to in his  
evidence that Government of the United States is taking  
-- it's undertaking in relation to the drilling in the  
Beaufort Sea, on the American side. I think that he



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1 indicated that they are spending something like \$56  
2 million on a study of the ecology of the Beaufort Sea  
3 and the likely impacts of drilling in deep water, before  
4 going ahead with drilling. Do you know if that is a  
5 situation in the U.S.? Is that the status of their  
6 examination of the same problem?

7 A Yes. The \$56 million, I  
8 believe, covers the whole of the Alaskan coast, includ-  
9 ing the Gulf of Alaska. But, quite a large fraction of  
10 this is being devoted to, primarily, wildlife research  
11 in the Beaufort Sea. This is now underway and has been  
12 underway for the order of about a year, getting underway.  
13 The field program did achieve a small kind of effort  
14 this last year. But, essentially, this is to be com-  
15 pleted prior to the actual granting of offshore rights  
16 to operate. That is my understanding. It is also my  
17 understanding that the State of Alaska is engaged, or  
18 about to engage in the sale of offshore lands.

19 Q Well, the granting of  
20 leases doesn't necessarily entail the granting of drill-  
21 ing permits, does it?

22 A No, I'm not really con-  
23 versant with the regulatory procedures on the Alaskan  
24 side, but I think, specifically, their long term program  
25 of -- if I recall about five years, is to be completed  
26 prior to any actual offshore drilling activities. I  
27 think there's also another reason for this, is that it's  
28 a far more difficult area to operate because of the  
29 proximity of the moving ice to the shore and the much  
30 smaller Continental Shelf. So, in my mind, there's no





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question about being able to use floating drillships in that area. I think it's really largely out of the question.

Q They are -- The Continental Shelf pinches in as we move westward towards the International boundary. The drop-off is much closer opposite, say the northern Yukon coast, then opposite the Mackenzie Delta and that tendency continues as you move west along the coast. Is that the situation?

A Yes. Also, the moving ice -- offshore ice -- frequently moves and the polar ice moves in much closer to shore there during the summer-time and if it does move offshore, certainly there's nothing to prevent it from moving -- the heavy ice from moving very close in. As experiences indicated, in the shipping that goes into the Beaufort Sea is often held up for, sometimes a large fraction of the summer in that area and once they get past Demarcation Point, Barter Island and so on. The going is generally much easier into the southern Beaufort Sea.

THE COMMISSIONER: I see. Thank you. Well, where were we in cross-examination?

MR. GOUDGE: I think we were with Mr. Evans.

CROSS-EXAMINATION BY MR. EVANS:

MR. EVANS: Yes, I just commenced my cross-examination when we broke. Now, in their testimony last week, the Beaufort Sea biology panel indicated that their estimates of recovery periods from a substantial oil spill, from a blowout, were based on there being no utilization of the species during the



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1 period. Were your estimates based on the same assump-  
2 tion?

3 A I think that's true. The  
4 estimate was taken from the biologists themselves. It's  
5 their estimate, it's not mine.

6 Q That's the ten years that  
7 you referred to?

8 A That's right as a guess.  
9 As the best guess that could be arrived at under the  
10 circumstances and certainly it did not take account of  
11 any pressure on those resources from hunting, fishing  
12 and so on.

13 Q Well, was any consideration  
14 given to how native people could compensate for the  
15 loss of annual resources during this substantial recovery  
16 period?

17 A Not in the Beaufort Sea  
18 project. No, this is strictly within the jurisdiction  
19 of Department of Indian and Northern Affairs in the  
20 granting of drilling authority and, as you probably know,  
21 this is restricted to a bond of \$10 million per well  
22 drilled, at the moment. But how this would be disposed  
23 of, is just conjecture as far as I am personally concerned.

24 Q Now, your preliminary  
25 environmental assessment dealt only with the possibility  
26 of a catastrophic event, a blowout, over a long period  
27 of time. Why did you limit your scope so finely? Why  
28 didn't you consider other less catastrophic events?

29 A The reason for that is  
30 that the project head -- he had terms of reference in the





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Cross-Exam by Evans

1 beginning which really dealt with -- and consideration  
2 of exploratory drilling only which implied a low scale  
3 of activity and the terms of reference really dealt with,  
4 well, would a drilling authority be granted or not  
5 based on environmental findings in -- that is a drilling  
6 authority in the immediate future. So it was confined  
7 to the initial exploratory phase, at least considerations  
8 of that phase. In my view, the kind of threat which  
9 would be associated with this kind of normal operations  
10 which would be undertaken by exploratory drilling in '76  
11 or '77 with just a few wells, would be extremely diffi-  
12 cult, if not impossible to assess. Really, it would  
13 appear to be of very little consequence compared to the  
14 major environmental problem of a blowout.

15 Q Do you think that we should  
16 study the threat of the environment to the operating  
17 systems, assuming that these exploration wells result  
18 in -- production wells.

19 THE COMMISSIONER: You mean  
20 development wells

21 MR. EVANS: Yes.

22 A I'm not sure just what  
23 you're -- could you rephrase your question there?

24 Q I'm not sure whether I can  
25 or not.

26 THE COMMISSIONER: Well, no  
27 what Mr. Evans is saying is that if these -- if they  
28 hit paydirt out there, then they'll want to build --  
29 they'll want to drill development wells and build lines  
30 to bring the gas and oil into the coast and he's saying



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Cross-Exam by Evans

1 "do you think we should study that"? I suppose the  
2 answer is "yes" if that becomes a matter of consequence.

3 A Well, yes. I think this  
4 is one of the questions that has concerned a lot of the  
5 investigators. In fact, it's "so what", you know,  
6 exploratory drilling. So this is just a start if  
7 exploratory drilling goes ahead then we really must then  
8 be concerned with the longer term, perhaps, sublethal  
9 effects of small series of polluting incidents which  
10 could occur on a regular basis over subsequent years.  
11 This, well, for example, in Cook Inlet, there have been  
12 many spill incidents just during the production phase  
13 there and also pipeline breaks. There have been these  
14 sort of failures in the Gulf of Mexico and to that end,  
15 we did go beyond our terms of reference to a certain  
16 extent to attempt to assess what the -- at least the  
17 problems would be concerning climate, because that seems  
18 to be the one which would provide an ultimate cutoff as  
19 far as mankind is concerned, that if you're involved in  
20 a situation where possibly it can change the world's  
21 climate, well, that's pretty tough on everybody.

22 So we dealt with that one as  
23 far as the production phase is concerned and an estimate  
24 as to what kind of spill level one might anticipate  
25 going off into the future, assuming -- well, I have it  
26 here-- assuming we're talking about the year 2,000 or  
27 and an assumption about how many production wells and  
28 the spill rate. The concern was really to say, assuming  
29 that one has a given rate of spillage and accidents,  
30 "would there be some effect on climate caused by the oil



6 2

A. Milne  
Cross-Exam by Evans

1 being incorporated into the Arctic pack ice and then  
2 perhaps resulting in premature melting of the Arctic  
3 pack and having prematurely melted it, reduced the  
4 reflection of solar radiation and therefore, perhaps,  
5 caused the ice itself to be removed entirely with this  
6 kind of climatic imbalance that would occur, and if so,  
7 that might reflect back on world climate, local climate  
8 and so on.

9                               So the real question was,  
10 how much of the ice surface in the Beaufort Sea and  
11 Arctic Ocean might be affected by production and explora-  
12 tory well accidents and delivery accidents off in the  
13 future. That is the subject of this document here, which  
14 I can leave, called "Oil, Ice and Climate in the Beau-  
15 fort Sea".

16                           THE COMMISSIONER: What's the  
17 title again?

18                           A       "Oil, Ice and Climate in  
19 the Beaufort Sea". This was done by Dr. Walker of the  
20 Frozen Sea Research Group and it mainly covers the two  
21 extremes of loss. Assuming over a year one has a given  
22 rate of loss of oil and, say .1% or .001% and assuming  
23 that there is 40% weathering factor, per year, then  
24 after a few years, one reaches a stabilized point where  
25 you have contaminated the Beaufort Sea with a particular  
26 quantity of oil. Because, if it weathers at 40% per  
27 year, then on a steady state basis, this rounds out to  
28 a fixed amount which remains in place. Then examining  
29 how big in area this amount of oil would contaminate  
30 and then, on that basis, assume that the ice would dis-





A. Milne  
Cross-Exam by Evans

1 appear rapidly in that area and compare this with the  
2 kind of fluctuations in ice cover which have been observed  
3 from satellite imagery recently, and from past  
4 fluctuation. In other words, the percent of the ocean  
5 that might be influenced by, on one hand, the amount of oil  
6 contamination from production; and on the other hand,  
7 by normal climatic extremes of ice cover in the sea.

8 His conclusion is even on a  
9 high loss factor, is that it would not appear to be  
10 significant, but this still raises a number of questions  
11 on, actually, what would the weathering loss factor be.  
12 That is one of the main factors here. This does not  
13 assume that any of this oil is intercepted by shorelines  
14 but simply that it remains out in the sea ice itself.

15 MR. GOUDGE: Is that report, sir,  
16 part of the Beaufort Sea project?

17 A Yes, it's part of the  
18 Beaufort Sea project.

19 THE COMMISSIONER: It'll be  
20 marked as an exhibit in due course. Well, carry on, Mr.  
21 Evans.

22 MR. EVANS: Yes. Now, I wonder,  
23 did that report discuss the Beaufort Sea gyre?

24 A It doesn't -- Yes. It  
25 does discuss what the ice circulation is like in the  
26 Beaufort Sea.

27 Q Based on that, how exten-  
28 sive would the oil spread? How extensive would it  
29 likely to be?

30 A Yes. Well, it really con-



A. Milne  
Cross-Exam by Evans

1 fines itself to -- perhaps this means I should really  
2 describe very briefly what the Beaufort Sea gyre is.

3 Q Yes. That would be help  
4 ful.

5 A -- And what the assumptions  
6 are. The Beaufort Sea gyre is the term given to the  
7 ice cover in the Beaufort Sea -- in the whole of the  
8 Beaufort Sea, which circulates in a clockwise manner --  
9 downward past the west coast of Banks Island, across the  
10 southern Beaufort Sea or at least across the Mackenzie  
11 Delta, out across the north end of Alaska and upwards.  
12 So you can imagine the large -- a large area of ice in  
13 the Beaufort Sea which is moving clockwise. Now, the  
14 reason for this clockwise movement is that over the  
15 Beaufort Sea, there is, on the average, a fairly stable  
16 set of weather systems and the winds from those weather  
17 systems, again, on the average, produce a clockwise wind  
18 stress on the ice cover and just keep this ice moving  
19 in a clockwise fashion.

20 That's a very gross over-  
21 simplification because the weather systems aren't averages  
22 they vary from week to week, so that it can back up,  
23 it can move in a variety of directions. Also, within  
24 the Beaufort Sea itself, parts of it can move at differ-  
25 ent rates than other parts. But, on the average, this  
26 will move around, completely circulated in approximately  
27 seven years, so that it does mean it's a relatively  
28 closed system with not much spin-off at the periphery.

29 This kind of circulation has  
30 been observed by the motion of ice islands over numbers



1988

A. Milne  
Cross-Exam by Evans

1 of years, T-3 in particular. So, it's quite well known  
2 which means that any oil which would be incorporated in  
3 that circulation is likely to stay there and degrade  
4 there and eventually disappear, if it can in that ice  
5 covered area.

6 Q Now, back to the question  
7 that I asked you before, what I was really trying to  
8 find out from you was, now, there would be an inclination  
9 to say we should drill the exploration wells in the  
10 Beaufort Sea and then find out if there's indeed any  
11 oil and gas there and then do studies on what the effects  
12 would be on the environment of a mass of production wells.  
13 Is it your opinion that this kind of study would take,  
14 you know, a long time and that we should, therefore,  
15 start it now, rather than waiting until after the ex-  
16 ploration program is finished?

17 A I think what you're getting  
18 at is that one should institute a planned program at  
19 this time, anticipating that production wells and de-  
20 lineation wells and so on -- production facilities  
21 would be downstream and I -- Yes, I think it makes  
22 sense to do this. At least to have a program planned  
23 in the event that exploratory drilling is given the go-  
24 ahead. I also want to mention that at this time, the  
25 environmental review process is trying to get off the  
26 ground in Canada and that for each kind of major activity  
27 anticipated in the country, there are sets of guidelines  
28 being developed.

29 One set of guideline is with  
30 respect -- guidelines, is with respect to offshore





A. Milne  
Cross-Exam by Evans

1 drilling. Now, these guidelines, at the moment, do not  
2 include, to my knowledge, offshore production facilities  
3 wellheads, and so on. Shore based facilities associated  
4 with these, I anticipate that this would be done but it  
5 doesn't exist yet. So that -- the trouble is it's kind  
6 of a responsive process and a proponent comes up today  
7 "O.K. we want to do this" and then, as a response, they  
8 requested to comply with these guidelines and if it's  
9 considered to be a sufficiently threatening activity,  
10 the proponent is required to go through an environmental  
11 evaluation.

12 So, it really doesn't fulfill  
13 the kind of purpose that you're talking about -- or  
14 is likely to fulfill that sort of purpose. I don't  
15 know, really, what the answer is other than putting  
16 together a -- the foundations for a viable program and  
17 being able to respond adequately when the situation gets  
18 a little closer, when it's obvious there may be --  
19 there might be some hydrocarbons offshore.

20 Q Mr. Milne, I understand  
21 that on December 4, 1975 Canadian Marine Drilling com-  
22 mented on your November 27, 1975 Preliminary Environmen-  
23 tal Assessment. That was an earlier draft of the report  
24 that you showed us. Now, to what extent did you in-  
25 corporate their comments in the final draft?

26 A There are a number of  
27 points of difference and you might remind me of some  
28 of these, but one of them was concerned -- the main one  
29 was the statement that I had made that elsewhere in  
30 Canada, offshore drilling activities required that time



A. Milne  
Cross-Exam by Evans

1 be given in the same season to drill a relief well. They  
2 pointed out that this wasn't necessarily the case off  
3 the Labrador coast. On further investigation with  
4 Energy, Mines and Resources who have the responsibility  
5 for controlling drilling off the east coast, it was --  
6 the response was basically along the line "yes" and "no"  
7 that it was the judgement of the drilling -- the govern-  
8 ment drilling engineer on the site to terminate operations  
9 toward the end of the season but that the -- while the  
10 environmental conditions of moving ice bergs and so  
11 on, were severe, it would still be possible to do some-  
12 thing. So that's the yes and the no of it.

13 So, this -- as a response to  
14 E.M.R. and not necessarily to Canmar, I watered down  
15 that particular statement in the final assessment.

16 The second one which was of  
17 concern was -- I made specific statements earlier on on  
18 probabilities of blowouts and then the Steering Committee  
19 of the Beaufort Sea Project in consultation with myself,  
20 decided, well, that's not our area of expertise. We  
21 are not drilling engineers nor do we -- all we can go  
22 by is what's in the literature and we get into a very  
23 speculative area, so we should just leave it in terms of  
24 speculation.

25 So, instead of specifying the  
26 one chance in 3300 which is in the literature, as a  
27 reasonable expectation of <sup>what</sup> the probability of blowout  
28 would be, we just put in a range of one in one thousand  
29 to one in ten thousand. Which really says, "yes, there  
30 is a probability of a blowout, but we don't know what



A. Milne  
Cross-Exan by Evans

1 that probability is". It's an acknowledgement that  
2 there are so few events upon which to base this informa-  
3 tion <sup>are</sup> each event is, in itself different, that no one  
4 can establish a number which you can call a probability.

5 There is the third item that  
6 Canmar was critical of and that is their capability of  
7 surface cleanup countermeasures. We made no changes in  
8 response to that particular criticism. There may have  
9 been others, but I've forgotten. I think those were the  
10 main ones.

11 Q I'm sorry, I don't have it  
12 in front of me, but --

13 THE COMMISSIONER: Excuse me,  
14 Mr. Goudge, you can pursue this, can you?

15 MR. GOUDGE: Yes, I'll be  
16 pursuing that and I intend to ask that it might be tendered  
17 as an exhibit.

18 THE COMMISSIONER: Don't worry  
19 about it.

20 MR. EVANS: O.K., I'll leave  
21 it to Mr. Goudge to pursue that matter further with you  
22 later. Now, what techniques to deal with a blowout are  
23 there, other than drilling a relief well?

24 A There -- If we look at the  
25 drilling system which -- All right, we don't even have  
26 to consider the specific drilling system. If a blowout  
27 should occur -- an oilwell blowout or oil and gas, then  
28 the problem is the -- to deal with the oilwell blowout  
29 in the subbottom itself. In other words, stop it there,  
30 where it's originating from and getting into the well  
31 bore. So, one technique which has been used is to drill





A. Milne  
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1 a relief well and pump cement into the oil bearing strata  
2 and plug it down there.

3 The next possibility is that if  
4 you can't do it there, is to grab it before it gets up  
5 to the surface as it's emerging from the hole in the  
6 bottom. The third, and worst situation, is that, all  
7 right, it's escaped to the surface and you put a band-aid  
8 on it by scooping it up there if you can. The only two  
9 components of the three I have mentioned which can be  
10 dealt with by Canmar are the first and the last. A method  
11 of containing it as it comes out of the hole is not in  
12 existence today.

13 Q I believe Dr. Lewis, in his  
14 testimony referred to a cone that was used in the Santa  
15 Barbara spill. Are you familiar with that?

16 A Yes. I understand there was  
17 an umbrella -- under water umbrella structure attempted --  
18 which was used -- an attempt was made to use this to  
19 contain the oil before it got to the surface which would  
20 have to be anchored on the bottom and this has been con-  
21 sidered in one of the Beaufort Sea project studies on oil  
22 spill countermeasures and part of that study was done under  
23 contract by Montreal Engineering and one of the suggestions  
24 they had for the Beaufort Sea was to develop an engineer-  
25 ing system which could deploy an underwater umbrella  
26 that could <sup>be</sup> moved over an underwater blowout.

27 But you can imagine in the Beau-  
28 fort Sea that that would be very -- to a certain extent --  
29 an impractical proposition because of bottom scouring.  
30 It also is -- has possibilities of it being impractical



A. Milne  
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1 because the problem of deploying it would be difficult  
2 in the wintertime following the occurrence of a blowout,  
3 you would -- perhaps not as difficult as maintaining a  
4 drillship in position to drill a relief well. But still,  
5 it would entail difficulties in deployment. But I think  
6 the bottom scouring is a major one and the problem of  
7 bottom anchoring is another one because of the quantities  
8 that would have to be stored during the winter. If one  
9 had a small blowout, well it wouldn't be much, but if  
10 you had a large one, it would be a lot of oil.

11 The third problem is that one  
12 would have to incorporate a separator to get rid of the  
13 gas otherwise the gas would buoy up this umbrella and  
14 create difficulties and so you would really have to be  
15 talking about an underwater production system, practically  
16 a crude underwater production system.

17 So, it has been thought about  
18 and at this time, no further engineering work has been  
19 devoted to that number two item.

20 Q So at the moment, technology  
21 has not advanced to the stage where there's a feasible  
22 umbrella system?

23 A Well, tech -- I look upon  
24 it as saying the technology doesn't exist at the moment.

25 Q Yes.

26 A Nor is it being pursued.  
27 actively to develop this second type of countermeasure  
28 control.

29 Q O.K. Now, I wonder, would  
30 it be feasible to drill two holes -- two exploration well



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Cross-Exam by Evans

1 in the Beaufort Sea close enough together that they could  
2 serve as relief wells for each other?

3 A Yes. I understand from  
4 -- this subject has come a number of times, the idea  
5 being that is there some way to, during the drilling  
6 season, to be able to have a companion well drilled which  
7 would act as a relief well in case of an accident in the  
8 first one. It's clear that each well would have to act  
9 as a relief well for the other well, otherwise one could  
10 have a blowout in the relief well system. Both would  
11 have to be cased and both would have to be located in an  
12 optimum position, relative to each other. Not only that,  
13 one would have to stop the drilling season early enough  
14 to permit each well to be drilled down to a suitable  
15 horizon with respect to the other by leading off in the  
16 direction of the other well.

17 So, it would mean that if both  
18 were going down to the same depth at the same time, that  
19 the drill bit would have to pierce the casing of one or  
20 other well and whereas this is a possibility, it's --  
21 it would not be a scheme which has been tried out before.  
22 It would also shorten the otherwise very short drilling  
23 season which exists at the moment and would double the  
24 cost of drilling a well.

25 Q Would you agree that that's  
26 a procedure that should be looked into further?

27 A I'd prefer to look at it  
28 this way, that the problem is the ability to drill a  
29 relief well during the season and that that's the opera-  
30 tor's problem if that, indeed, is a constraint which





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1 would be applied and that he would obviously have to be  
2 given the option to figure out how it would be done and  
3 perhaps knows better than I do your better than --  
4 well, better than I do, certainly on how this might be  
5 accomplished.

6 THE COMMISSIONER: You mean that  
7 if that's a condition imposed in this instance by the  
8 minister then -- or ministers -- then the operator should  
9 decide whether he wants to end his drilling season in  
10 sufficient time to drill a relief well or whether he  
11 want to drill a companion well?

12 A Yes, I think that, you  
13 know, basically, it's his problem. The effect of not  
14 doing it is our problem.

15 THE COMMISSIONER: Yes, I under-  
16 stand.

17 MR. EVANS: Mr. Milne, on page  
18 one of your prepared testimony, you stated that:

19 "To date, drilling authorities in the Arctic and  
20 elsewhere offshore have been granted where it is  
21 possible, to extend the drilling season long enough  
22 to implement measures to control wild wells."  
23 Information<sup>provided</sup> in "Oil Under the Ice" indicates that your  
24 statement does not apply to Panarctic's operation in  
25 Sverdrup Basin. That in fact, the drilling season there  
26 is no longer than in the Beaufort Sea. I wonder if you  
27 could comment on that and clarify the point you made  
28 in your paper?

29 A Yes. In the archipelago  
30 I believe in the Hecla wells they're referring to, they



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1 were considered at that time, as being delineation wells ,  
2 for a gas field and provided they did not -- somebody  
3 might correct me on this -- but my understanding is that  
4 provided they did not drill beneath beyond the kind of  
5 strata which was recognized as containing gas, then they  
6 were considered as gas delineation wells and that was  
7 used as grounds for permitting them to drill that well  
8 offshore, whereas the original one was onshore.

9 I believe in the Jackson Bay  
10 wells that the requirement now is that they have a  
11 companion ice platform which would have to be used to  
12 support a drill rig to drill a relief well and that  
13 drilling would only be permitted on the original well --  
14 at least over a period of time -- that would permit this  
15 relief well to be drilled toward the end of the season.  
16 Now, that's my understanding of the situation.

17 Q Well, do you have any  
18 actual information on the drilling schedule for the  
19 Jackson Bay project?

20 A I don't have any -- I could  
21 get it. It does exist, but I don't have it with me.  
22 I really haven't got it.

23 Q You couldn't make an  
24 estimate?

25 A No, I'm really not familiar  
26 with the Jackson Bay drilling schedule.

27 Q O.K. That's fine. No  
28 further questions.

29 THE COMMISSIONER: Thank you,  
30 Mr. Evans.



A. Milne  
Cross Exam by Gibbs

1 MR. GOUDGE: I wonder sir, it's  
2 almost 12:30, would this be an appropriate place to  
3 break for lunch?

4 THE COMMISSIONER: Certainly.

5 MR. GOUDGE: 2 o'clock?

6 THE COMMISSIONER: Yes, 2 o'clock.

7 (PROCEEDINGS ADJOURNED AT 12:25 P.M.)

8 (PROCEEDINGS RESUMED AT 2:15 P.M.)

9 THE COMMISSIONER: Well, we'll  
10 come to order. I found the list of matters I wanted to  
11 raise with you, Mr. Milne, which I couldn't find this  
12 morning and I realize they've all been discussed one  
13 way or another so. So, where are we now? Mr. Gibbs, I  
14 think.

CROSS-EXAMINATION BY MR. GIBBS:

15 Q Mr. Milne, your  
16 whole script of disaster is based upon a well blowout,  
17 isn't it?

18 A That's right, yes.

19 Q Do you know what the normal  
20 cause of the well blowouts are?

21 A They're basically, as I  
22 understand it, the normal causes are human error. For  
23 example, a failure to test equipment which you rely  
24 upon and so on. This has been generally the case in past  
25 history, is failure to utilize trained personnel or  
26 experienced personnel and failure to follow accepted  
27 procedures, failure to follow the plan, etc.

28 Q You'd agree that a well  
29 blowout is probably as disasterous to the operator as  
30 it is to anyone?





A. Milne  
Cross-Exam by Gibbs

1 A Oh, most certainly.

2 Q And that when the disasters  
3 have serious financial consequences he's probably  
4 going to take proportionately more care?

5 A I just didn't catch the  
6 last part of your question.

7 Q I say if the disaster is  
8 likely to have serious financial consequences, the  
9 standard of care is probably going to increase proportion-  
10 ately?

11 A Yes.

12 Q Have you ever had any-  
13 thing to do with a well blowout?

14 A No.

15 Q Have you ever had anything  
16 to do with the drilling of a well at all?

17 A No. I've observed well  
18 drilling in process, that's all.

19 Q Your whole study, sir,  
20 is based upon assumptions, isn't it?

21 A Oh yes, most definitely.

22 Q You assumed a well depth ,  
23 you assumed well pressures; you assumed a composition  
24 of the well stream; you assumed volumes; you assumed ice  
25 conditions; temperature conditions, wind conditions,  
26 water levels, currents, time of the year, remedial measures,  
27 length of the time for the environment to recover and  
28 so on.

29 A There are a few items there  
30 which are not based on my assumptions. They were based



A. Milne  
Cross-Exam by Gibbs

1 on consultation with industry; mainly the volume of the  
2 flow which would be expected from a blowout in the  
3 deltaic formations in the Beaufort Sea, and I think there  
4 was one other one there. I've just forgotten what it  
5 was. But, I think --

6 MR. RAYLY: Maybe Mr. Gibbs  
7 could go over them, so the witness can respond properly  
8 to them. There was quite a list of them.

9 MR. GIBBS: All right, sir.  
10 You assume the depth of the well which would blowout?

11 A No. The assumption was  
12 that it would likely occur toward the end of the drilling  
13 season.

14 Q But you assumed no well  
15 depth?

16 A No. Not in the assessment,  
17 no.

18 Q In your experience, is  
19 there generally a relationship between well depth and  
20 pressure within the reservoir?

21 A No, I don't think I con-  
22 sidered relationship between depth and pressure. What  
23 was under consideration was the fact that a blowout  
24 would probably occur toward the end of the drilling sea-  
25 son and my information from both Canmar and from industry  
26 is that at shallow depths, there's more likelihood of  
27 a blowout occurring, but then at shallower depths, the  
28 blowout is more likely to be gas. At deeper depths,  
29 there is a possibility of an oil well blowout. However,  
30 the probability of it occurring either shallow or deep



A. Milne  
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there doesn't appear to be any difference.

Q You made an assumption as to the pressure within the reservoir from which the oil stream would blow?

A No, this wasn't a consideration in the assessment.

Q Well, I wonder how you could come to any conclusion as to the volumes of the-- whatever is in the reservoir without knowing what the pressure was in the reservoir.

A This was based on consultation with A.P.O.A. group who are convened for the purpose of determining what would be a standard "well blowout", offshore, in the deltaic formations of the Beaufort Sea. So this was done in consultation with the oil industry solely.

Q But what concerns me that there's no such thing as a "standard blowout" in the deltaic formations in the offshore is there?

A For the purposes of constructing a narrative, it was necessary to make some assumption as to the volume which might be expected and it was resolved on the basis of the figures which are in the assessment.

Q Well then, to assume volume built into that is an assumption as to pressure within the reservoir. Do you agree with that part?

A That is implied by you and I presume, also by the oil industry advisors.

Q And you assume the composi-





A. Milne  
Cross-Exam by Gibbs

tion of whatever was coming out of the well bore?

A That was also done in consultation with the oil industry and as a result of these consultations, we decided that probably the closest kind of material -- the closest material which could be identified with the expected oil, could very well be a Norman Wells crude. However, it's recognized that there are all ranges of possibilities which may possible arise from offshore.

Q There is, in fact, an infinite range of mixtures that could be present in the reservoir?

A Yes, there could be a complete range of viscosities and materials and I agree.

Q You assumed certain ice conditions.

A Yes, that's true.

Q You assumed certain ambient temperature conditions.

A Yes.

Q You assumed certain wind conditions.

A The -- Yes, but those were based on past statistics. Also, implied in the ice conditions, there's a review of the historical ice cover which, to a certain extent, confirmed a picture of an expectation one might have at that time of year.

Q Best it can give you is an average year, isn't it?

A That's ture. Although you'l



A. Milne  
Cross-Exam by Gibbs

1 probably note on reviewing the assessment that a parti-  
2 cular -- a specific year, namely last year -- was chosen  
3 as the condition upon which to develop the narrative.

4 Q But not on the basis that  
5 last year was any more typical or average than any other  
6 year?

7 A No. It was chosen this  
8 way simply because no year is a typical year.

9 Q For the purposes of your  
10 study, you assumed that every year would be like last  
11 year?

12 A No, it was stated in my  
13 study that that year was chosen and on the basis of that  
14 year, then we have certain expectations from that  
15 narrative.

16 Q You made an assumption as  
17 to the time of year at which the well -- this mythical  
18 well would blowout.

19 A That is true. For the  
20 purposes of the narrative, that was necessary.

21 Q You assumed a length of  
22 time within which control might be regained of the well.

23 A Yes.

24 Q And that, I take it you  
25 would agree, would depend in part upon the pressure within  
26 the reservoir?

27 A No, I wouldn't -- that is  
28 beyond my expertise and simply that duration was based  
29 on the time it might take to drill a relief well and on  
30 the duration between operating seasons.



A. Milne  
Cross-Exam by Gibbs

1 Q Really, sir, your study  
2 bears no relationship as to what one would really expect  
3 to happen, though.

4 A It has a bearing -- it  
5 a bearing on what one might expect to happen. However,  
6 it certainly would not necessarily apply to next year  
7 or the following year. It simply applied to a certain  
8 instance in past history.

9 Q Well, as I understood,  
10 some of the material, sir, statically, the chances  
11 of a blowout at all are in the range of anywhere from  
12 one tenth of one percent to one hundredth of one percent.

13 A Yes.

14 Q And, therefore, the chances  
15 of a blowout with all of the conditions that you assumed  
16 must be infinitely less likely.

17 A This, I would not say  
18 "infinitely less". I think you're referring to the  
19 chances of a coincidence of a blowout with those specific  
20 environmental situations which are described.

21 Q Well, with every one of  
22 the variables and the whole study is based upon variables  
23 being, as you have assumed them be in your study.

24 A Oh, I disagree.

25 Q You disagree with what?

26 A I disagree with your  
27 statement that it would be an infinitely less probability  
28 of existing as described in the narrative, in basic  
29 intent.

30 Q Can you give me the





A. Milne  
Cross-Exam by Gibbs

1 statistical probability of an incident occurring with  
2 a well blowing out at the time of year which you have  
3 assumed, with the temperatures, ice conditions, composi-  
4 tion of the stream and all the rest of those assumptions  
5 being exactly as the way you have them?

6 A I would not like to answer  
7 that directly because it doesn't appear to me to be  
8 applicable to the situation as described. The reason  
9 I say that, is if one starts off with an assumption of  
10 the probability of a blowout within a certain range,  
11 that has been the range accepted by industry, then,  
12 from that point onward, it is clear that if one gets  
13 down to the bottom of the ecosystem and tries to estimate  
14 what the environmental effect might be on one particular  
15 organism, then it's clear that one can only have it --  
16 it is affected or it is not affected. To assess the  
17 probability of the effect on one independent organism,  
18 is an impossible task. One has to view, not the in-  
19 dependent organism, but the overall effect on parts of  
20 the ecosystem.

21 For example, an estimate of the  
22 effect on fisheries which would be somewhat independent  
23 of the previous specific path of oil distribution.

24 Q I think I'm right, sir,  
25 in saying -- and perhaps I'm not -- you can correct me  
26 if I'm not -- that you have based your study on the  
27 worst case.

28 A Not quite the worst case  
29 because if the oil well did blow for two years, that  
30 could be worse than blowing for one year.



A. Milne  
Cross-Exam by Gibbs

1 Q Did you make any attempt  
2 to do it on a -- an average case, if you like -- some-  
3 thing not perfect and something not the worst imperfect  
4 conditions?

5 A The assumptions upon which  
6 the assessment were based are stated in the document.  
7 The device was used of a narrative, simply to describe  
8 a possible situation. It is not necessarily the most  
9 probable situation.

10 Q Yes and have you made any  
11 attempt to forecast a most probable situation?

12 A That is, again, I -- no.  
13 I think the problem here is that the -- there isn't  
14 enough statistics of the behavior of the environment  
15 to develop what one might would call -- one might call  
16 a most probable situation. There is a great deal of  
17 variability in each of its component parts and the  
18 degree of this variability is not known. It can only be  
19 guessed at in some components of it and other components  
20 of it. For example, ice movement and ice cover -- it's  
21 known with more precision.

22 Q Then sir, if there is a  
23 blowout, if one of these one tenth of one percent  
24 possibilities occur, there's no way from your study that  
25 one can assume the most probable consequences of it?

26 A No, what this has been  
27 portrayed, are possible consequences. However, the  
28 precision with which a blowout is, you know the knowledge  
29 of whether a blowout might occur or not, is known perhaps  
30 with as little precision as the consequences, between one



A. Milne

Cross-Exam by Gibbs

Cross-Exam by Marshall

1 and one thousand and one in ten thousand is to arrange  
2 between two orders of magnitude which can only be based  
3 extremely limited data.

4 Q Well I would <sup>have</sup> thought, sir,  
5 that living in a world which operates not always at the  
6 extremes that the most probable one that we would look at to  
7 anticipate the required remedial or preventative measure,  
8 but that's not what you tried to do.

9 A I'm sorry, I didn't follow  
10 you there. Could you repeat that please?

11 Q I'm not sure I followed it  
12 myself. I was suggesting to you sir, that it'd be more  
13 helpful if you had looked at it as a more -- the most  
14 probable occurrence rather than an extreme occurrence.

15 A I think that one can only  
16 develop probability of an occurrence having experienced  
17 those occurrences and hopefully we will not experience  
18 occurrences such as an offshore blowout. Therefore, one  
19 has to construct the picture based on what is considered  
20 to be a fair degree of knowledge and I don't know whether  
21 I can really answer very much more precisely beyond that.

22 MR. GIBBS: All right. Those  
23 are all my questions.

24 CROSS-EXAMINATION BY MR. MARSHALL:

25 Q Sir, I was wondering whether  
26 or not you had any information about nearshore drilling  
27 off Prudhoe Bay being proposed in shallow waters?

28 A No, I have no information  
29 on offshore drilling proposals from Prudhoe Bay.

30 MR. MARSHALL: Fine, I have no





A. Milne  
Cross-Exam by Marshall  
Cross-Exam by Goudge

1 other questions.

2 CROSS-EXAMINATION BY MR. GOUDGE:

3 Q Mr. Milne, we don't have a  
4 copy of your full report tabled yet as an exhibit. I  
5 would like to do that and perhaps, you told us when you  
6 were here the other day that one of the purposes of the  
7 report was to see if offshore drilling could be conducted  
8 with a minimum but acceptable risk to the environment.  
9 I think that's the phrase you used. Not to get you to  
10 go into this specific set of drilling holes but to help  
11 us in general, what did you use as an operating defini-  
12 tion for "acceptable risk"?

13 A I didn't use any criterion  
14 for "acceptable risk" at all. The risk is merely  
15 stated -- at least what is at risk is stated and the  
16 probability of encountering a situation which would put  
17 the environment at risk is stated. Nowhere has a judgement  
18 been made what is acceptable or what is not.

19 Q It's up to the decision  
20 makers to provide the definition of "acceptable" I take  
21 it?

22 A That is right, yes.

23 THE COMMISSIONER: You outlined  
24 the extent of the risk and the consequences if this  
25 event occurred -- the risk of the event occurring and the  
26 consequences of the event, so far as you could ascertain  
27 either the extent of the risk or the consequences of the  
28 event and you leave it to the politicians to determine  
29 whether it is acceptable or not. That's their job.  
30 Isn't that the long and the short of it?



A. Milne  
Cross-Exam by Goudge

1 A That's correct.

2 MR. GOUDGE: I take it sir that  
3 you have given some thought, though not as part of your  
4 project to risks that may be inherent with the possibility  
5 of future development should they hit paydirt, as was  
6 said this morning and provide for production wells and  
7 the laying of pipeline networks. In a general sense,  
8 you've given some thought to that?

9 A Only with regard to  
10 possible effects on the sea ice and then the possible  
11 consequences on climate and not on the wildlife.

12 Q Yes.

13 THE COMMISSIONER: This is the  
14 -- that is the report prepared by Dr. Walker.

15 A That is correct.

16 MR. GOUDGE: And insofar as  
17 your project dealt with long-term effects, that report  
18 is the sole long-term effect report?

19 A Except that it's clear  
20 that the state of fisheries' knowledge and other wildlife  
21 in the Beaufort Sea will be part of the study reports  
22 and from -- these provide baseline data from which all  
23 evaluations of possible impact of offshore production  
24 could be made.

25 Q Yes. You told us, I think,  
26 last time when you were here that research necessary to  
27 evaluate the impact of long-term development would be  
28 more necessary in some areas than in other areas --  
29 fisheries as an example of perhaps an area of where less  
30 would be needed to complete the picture.



A. Milne  
Cross-Exam by Goudge

1 A That is correct, yes.

2 Q Yes. Have you given any  
3 thought to the level of research that would be needed on  
4 an ongoing basis to fill in the gaps?

5 A Yes, on fisheries let me  
6 just point out an example that I've had in mind and the  
7 problem with fisheries. I think the history of fisheries  
8 research in Arctic regions has started off as it does  
9 elsewhere and that is where the classification of extant  
10 species -- their feeding habits, ages and reproductive  
11 habits. However, not very much attention has been paid  
12 to populations and their distributions and their habitat  
13 and how the habitat of these populations and their re-  
14 productive facilities can be affected by pollutants.  
15 In other words, how is the local ecosystem affected since  
16 they are part of it. So, it is the habitat problem and  
17 the population problem which is the <sup>one</sup> not attacked with  
18 vigor at this time.

19 Q Yes. Going beyond fish  
20 to other components of the environment, I take it there  
21 too, you feel that in some areas we're in a better position  
22 concerning baseline data to allow us to deal with long-term  
23 development and in other areas, we're less well off.

24 A That is true, I think we're  
25 in better shape on knowledge of the ice cover and it's  
26 general motions, simply because it's more observable and  
27 has been observed by -- from aircraft and satellites  
28 recently and from occupation of ice islands and so on.  
29 So, the general movements and the behavior of ice has  
30 been far, far better known than the lower trophic level





1 of the ecosystems.

2 Q Yes. Now, if you were  
3 devising a research program to deal with the impact of  
4 future long-term development and if you assumed roughly  
5 the level of funding that your project had, how many  
6 years would you think would be necessary to get us to  
7 a position that you'd be satisfied?

8 A I -- you mean to bring the

9 Q To allow us to deal with  
10 the possible impact of long-term development, including  
11 production wells and flowlines.

12 A I find it difficult to  
13 respond to that, simply because we're dealing with --  
14 O.K., we have to make comparisons, between say, the  
15 Beaufort Sea region and say the Gulf of Mexico and to  
16 recognize that possibly the knowledge of the ecosystem  
17 there, is not well enough developed or could it necessari-  
18 ly be well enough developed in many years to come up  
19 with that knowledge at all. It's a question of an ex-  
20 ercise in human imagination as to what the impact is  
21 likely to be. I don't know whether I've made myself  
22 clear here. What I'm trying to get at is that to put  
23 ourselves or the biologists in the situation to really  
24 say "this is the impact" is, in my belief, not within  
25 the current -- we don't have enough knowledge to put  
26 ourselves in that state. There's more guesswork involved  
27 in impact of ecosystems and the chain of events than is  
28 involved in, say, the more physical aspects of the en-  
29 vironment. Now, a biologist could perhaps argue with that,  
30 but that's my impression.



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Q Yes. I was trying to elicit from you and perhaps it's a question that isn't capable of an answer, your view as a project manager as to how long it would take to put us in a position where you could make some estimate of the impact of long-term development, taking into account that you would have to fill these gaps that exist concerning interrelationships of ecosystems and so on.

A Well see, I'll try to respond to that. The -- I think if the -- if there is a concentration made on where are the -- where is the main production, you know, where is the main biological productivity and how did the organisms in the Beaufort Sea utilize the chemical nutrients and what are the sensitive areas, then I think -- I make a wild guess here, then to come to grips with that, might take, say about between five and ten years to get a much better picture of what's going on. I think that it would take perhaps maybe two -- two years as a wild guess to advance the state of that knowledge considerably, simply because we're now in the state of recognizing -- or realizing the existence of various inshore habitats which weren't necessarily realized or recognized before.

Now, I think -- now biologists could probably pick that to pieces, however, one could advance the state of knowledge significantly, say with a few years, and then put ourselves in a much better position as to the linkages, the problem of the effect of pollutants on the various linkages in the food chain. That would take considerably longer.



A. Milne  
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1 Q In terms of the manning of  
2 your specific project, sir, you told us that the price-  
3 tag was about \$12 million. Roughly, how many people  
4 were engaged doing studies for you?

5 A I'll just put it in terms  
6 of the scientists who were responsible, first of all.  
7 In direct responsibility, we're looking at about 40 to  
8 50 scientists, and then when you add the other facilities  
9 which are manned, well, you could increase that number  
10 by another 50 percent.

11 THE COMMISSIONER: You mean a  
12 crew for the ships and so forth, that kind of thing?

13 A Yes. But they're for a  
14 very short period of time. Likewise, the scientists  
15 don't necessarily apply themselves a hundred percent of  
16 the time to the Beaufort Sea project, it may be about  
17 half the time, in many cases less than that.

18 MR. GOUDGE: Now, while it's  
19 been canvassed sir, let me ask you one or two more  
20 questions about potential climatic changes. You were  
21 referred last day to an article by Messrs. Campbell  
22 and Martin and you expressed some doubt about it. Let  
23 me read you a comment about the paper and ask you to  
24 comment on the comment, if you would.

25 "A recent paper"--  
26 and that's the paper I refer to, Campbell and Martin,  
27 "plausibly suggests that a large spill of oil in the  
28 Beaufort Sea is physically capable of reducing the  
29 albedo that's the reflectivity of large areas of  
30 the Arctic pack ice, the oil could emulsify into





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1 small highly persistent droplets which, circulated  
2 in the currents, would collect on the underside of  
3 the pack ice. Seasonal melting on top and freezing  
4 on the bottom would then yield the darkened ice  
5 surface in a few years. It is well known that the  
6 Arctic pack ice is in an extremely delicate state  
7 and could be quickly melted by certain types of  
8 small perturbations with profound and irreversible  
9 effects on world climate."

10 You said last day that that paper should be doubted  
11 because of certain assumptions they made, which, in your  
12 view, were not sound. I wonder if you could tell us  
13 what those assumptions were.

14 A Well, one of the major  
15 assumptions -- I think to be fair to Campbell and Martin  
16 also, that they did base their calculations on extremely  
17 thin distributions of oil. In other words, a millimeter  
18 thickness and then made other assumptions. They get a  
19 spread of thickness as in the spread of quantities.  
20 Based on the minimum thickness of oil evenly spread and  
21 a large quantity, then they do their calculation. This  
22 would influence an extremely large area and they built  
23 in a factor of, I believe, 25 percent loss of oil by  
24 evaporation of that quantity. But, they weren't looking  
25 at biodegradation.

26 But, I think the subsequent  
27 experimental work has shown that the minimum thickness  
28 of oil which can exist under ice because of surface  
29 tension is somewhere in the order of about half a centi-  
30 meter. So that's the first factor."



A. Milne  
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1 Also, they indicate that the  
2 flow --

3 Q Let's just pausing there  
4 so I understand it, I take it the consequence of that is  
5 that any oil spilled will cover a lesser area than  
6 Campbell and Martin?

7 A That's right. That's the  
8 first thing. The second thing is that they did not  
9 take account of the -- what you might call the pucketing  
10 or herding effect or the concentrating effect of the  
11 roughness on the underside of the ice and within the  
12 leads, which is a second factor which would reduce the  
13 area which would be influenced. They also made the  
14 assumption that the oil from a spill -- from a surface  
15 spill, would -- a large part would go underneath the  
16 ice. Now, I think only in rare circumstances would any  
17 oil from a surface spill go underneath the ice, simply  
18 because the density of oil is less than the density of  
19 water and sea ice.

20 Only in the circumstances where  
21 ice provides a barrier for oil coming to the surface of  
22 water, would the oil stay under the ice. However, there  
23 are cracks and leads so as soon as the first crack or  
24 lead is encountered by oil which was already underneath  
25 the ice, it would flow up into the lead and over the top.  
26 So, this does mean that you do not have great quantities  
27 of oil under the ice in this particular example, as  
28 described. So, the migration period of oil to the sur-  
29 face of the ice over a period of four years is not quite  
30 realistic, either. But, what I'm getting at here, is



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1 that, taking account of the erroneous assumptions which  
2 were used, the area which would be covered, would be  
3 considerably less in orders of magnitude less -- many --  
4 several orders of magnitude less and they did not talk  
5 about biodegradation on a year to year basis and the  
6 ultimate fate of that particular oil.

7 As they state in their article,  
8 it's just -- they printed it just to "stir up contro-  
9 versy on the matter" and they did. They had a response  
10 by this paper here by A.E.R.S. on oil spills and the  
11 extent of spreading which put the situation in a more  
12 realistic light, but again, based partly on lack of  
13 specific experimental information. I don't know whether  
14 that sort of covered the --

15 Q Yes sir, that flushes out  
16 what you had left with us last day. Then, in referring  
17 to Dr. Parker's study this morning, you gave me to infer  
18 at least that the long-run risk of oil spills on climatic  
19 conditions would not be all that different from the risk  
20 you recite in your study arising from these two drill  
21 operations.

22 A That appears to be the case  
23 simply because the area which would be covered by say  
24 a .01 percent spillage rate over the production period  
25 would not appear to cover a significant fraction of  
26 the ocean, bearing in mind that included in that is an  
27 evaporative and degradation factor as well which permits  
28 stabilization of the amount which remains in the ocean.

29 Q You said last day when  
30 you were here, though, I think, that -- I think I recall





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1 you correctly that the long-term risk to climate from a  
2 proliferation of development and production facilities  
3 was, nonetheless, of a different order of magnitude.

4 A That is correct.

5 Q Would you still stick by  
6 that?

7 A Yes, it is of a -- it is,  
8 certainly, of a different order of magnitude. If we're  
9 looking at the possibility of one blowout, in one year,  
10 this would have no significant effect on climate in as  
11 far as I am concerned. The amount of oil which would  
12 accumulate over many years of exploratory well, delineation  
13 wells -- I'm not talking about increasing the  
14 probability of blowouts, simply pipeline breaks, transport  
15 and so on, would amount to an estimate -- making an  
16 estimate of what percentage of the offshore production  
17 would be lost into the environment involves making that  
18 assumption and the assumption can be made based on past  
19 experience in other areas of the world, in Cook Inlet,  
20 for example on the rate of loss of production there,  
21 taking the two extreme ranges, an optimistic one and a  
22 very pessimistic one, looking at an extreme range of  
23 possible production of offshore oil, as well, and then  
24 applying a 40 percent per year loss. Then, based on  
25 that, 40 percent per year loss --

26 THE COMMISSIONER: Owing to  
27 weather?

28 A According to weathering  
29 and evaporation and sinkage of the tarballs and beaching  
30 of some of the debris, possibly, then it would appear



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1 that the effect on climate would be insignificant.

2 Q Higher order of magnitude  
3 risk but still insignificant?

4 A Yes, but still small com-  
5 pared to anything that would appear to cause a problem  
6 with climate.

7 Q Yes. Now, sir, in your  
8 report itself, at pages 37 through 39, you deal with the  
9 value of Arctic marine wildlife to humans. Do you have  
10 that in front of you?

11 A 34 to 39?

12 Q In my copy, it's 37 to 39.

13 A Oh, 37, right. I have that  
14 in front of me.

15 Q You go through a variety  
16 of Arctic marine wildlife and attach values to each of  
17 them. I wonder if you could tell us how you went about  
18 that task, attaching values?

19 A These evaluations were  
20 obtained from a Mr. W. Brackell who is a wildlife  
21 economist with the Department of the Environment now  
22 located in Edmonton with the Canadian Wildlife Service.

23 Q Did he do a study which  
24 yielded these values?

25 A He was -- just to reflect  
26 a bit of background here, I felt that it was necessary  
27 to come to grips with some aspects of the economic values  
28 of the wildlife resources. It turned out that he was  
29 interested in pursuing this himself so he was provided  
30 travel funds to try to dig into this problem. To the



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1 extent of the investigation, he was -- it was possible  
2 for him to perform. These reflect some of the results  
3 which he had derived.

4 Q Can you tell us sir, or  
5 does it take you beyond your own knowledge how he derived  
6 these figures?

7 A He derived these figures  
8 based on information gleaned from consultations with  
9 the Department of Indian and Northern Affairs with  
10 consultations with fisheries officers in the Arctic here.  
11 He took several trips to the communities and into the  
12 delta. O.K., that's the picture -- is that?

13 Q Well, let me take a specific  
14 example and see if I can get a slightly more detailed  
15 understanding. Your report says on page 37 that the  
16 hunt and annual harvest of whales in the Mackenzie Delta  
17 is valued at about \$5000. Is that correct?

18 A That's correct, it's in  
19 the report.

20 Q Yes. Now, let me ask you  
21 how that figure was derived?

22 A I think, at this  
23 point, I am not a wildlife biologist and the precise  
24 details of how that value was arrived at, I do not know.  
25 However, these values were extracted from a preliminary  
26 report of Mr. Brackell's.

27 THE COMMISSIONER: Well, why  
28 trouble Mr. Milne with these things. He's not --

29 MR. GOUDGE: I was about to ask  
30 sir, if he could provide us with that report which would





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1 tell us how it was done. I'm simply concerned that we  
2 know that so that any limitations on the methodology  
3 used to derive these figures can be provided as a context  
4 in which to regard the figures. Is there a report  
5 available, Mr. Milne?

6 A That is a sore point. We've  
7 been urging the author to get his report out and, thank  
8 you very much for giving me more ammunition.

9 Q Well, we would be very  
10 grateful if he could provide us with that report because  
11 until he does, we're simply left with these figures with-  
12 out any knowledge of how they were derived.

13 A Exactly.

14 MR. GIBBS: Well, we could ask  
15 for an order that it be produced. Then I would come even  
16 more quickly.

17 MR. GOUDGE: Mr. Milne may ask  
18 for an order, it may be of <sup>some</sup> assistance to him. If you  
19 could relay that to him, sir, and if a report becomes  
20 available, we would be very grateful to receive it  
21 through Mr. Bayly.

22 THE COMMISSIONER: Tell him it  
23 would be helpful to us to have it by March 15.

24 A It would be helpful to me  
25 to have it a lot earlier. Yes, I'll do that.

26 THE COMMISSIONER: Cut off his  
27 travel funds.

28 MR. GOUDGE: One or two points  
29 before I come to the Canmar document Mr. Milne. On page  
30 six of your evidence, you refer to winter storm surges  
and I asked Dr. Lewis this and perhaps you can tell us --



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1 a winter storm surge -- can it occur when the ice cover,  
2 when the landfast ice has firmly formed and butted up  
3 against the pack ice or does it require open water?

4 A It requires -- evidence  
5 indicates that there was probably open water at that  
6 time that the pack and part of the -- what was incomplete-  
7 ly formed land fast ice had moved offshore leaving an  
8 expanse of open water. It was a wind action and a rapid  
9 turn around of the offshore winds that resulted in a  
10 small surge at that time.

11 Q So that any risks we've  
12 heard connected with storm surges would not apply when  
13 the land fast ice has fully formed and extended out to  
14 the pack ice?

15 A The only possible effect  
16 on land fast ice would be to perhaps cause a small  
17 movement of the land fast ice, although that's speculation.

18 Q On page twelve of your  
19 evidence, you refer to the possibility of detecting in  
20 the spring fragmented oil trails by radio beacons. I  
21 take it that means the placing of radio beacons on the  
22 pack ice to follow the movement of the pack ice and hence  
23 the movement of the oil underneath it?

24 A That is true.

25 Q Do you know whether any  
26 technology exists to allow the detection of oil under  
27 ice by means of, for example, infra-red devices?

28 A The number of trials in  
29 the Beaufort Sea project were concerned, studies and  
30 limited field trials were concerned with that problem of



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1 remote sensing of oil under ice. There doesn't appear  
2 to be any viable technique for doing this.

3 Q Now sir, in your scenario  
4 one of the things that you took into account, I take it,  
5 was the kind of manpower that might be necessary to  
6 engage in the contingency plans that would be put into  
7 effect?

8 A That is true. This wasn't  
9 mentioned as part of my report.

10 Q What kind of manpower are  
11 we talking about? What order of numbers?

12 A I would -- I have no  
13 experience in mobilizing manpower but, and I think in  
14 this particular case of dealing with offshore spills  
15 in an Arctic environment, it would mean there would be  
16 two situations. There'd be summer manpower to deal with  
17 the marine situation in open water. There would be man-  
18 power dealing with springtime operations on the sea ice.  
19 I think that would be a most difficult one to find  
20 trained manpower to operate under those circumstances.  
21 I could only make wild guesses on the number of people  
22 required to deal with the open water situation. I think  
23 it's generally understood that inshore land based cleanup  
24 operations would probably do more damage to the lowlands  
25 than just simply leaving it alone. So we're really  
26 dealing with manning marine equipment installation of  
27 booms offshore with small boats. So it would depend on  
28 how many people you could get aboard these boats either  
29 offshore or onshore and it doesn't look as if it would  
30 involve very many people.





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Q Now, on page 24 of your evidence, sir, you referred to an environmental prediction system which might prove of some assistance in this project and presumably in the case of long-term development as well. Could you perhaps tell us what that involves?

A Yes. The term "environmental prediction system" refers to an atmospheric environmental services computerized weather and ice movement prediction system which has been part of the Beaufort Sea project study. The output of the Beaufort Sea project study is really to describe the possible effectiveness and the application of such a system, should offshore drilling commence. Now, quite clearly, in order to get -- to reach that point, it has involved the development of the initial parts of that system. In other words, the computer programs, the development of offshore weather sensors and so on.

However, the deployment of the system as designed is not going to take place in 1976, simply because the total cost of this -- at least almost the total cost of that would fall upon the one operator, Canmar, who is reluctant to fund the whole system. So, the -- again, the object of the prediction system is to provide more rapid updating of current weather in a real time sense -- in a more real time sense and to provide a prediction of ice movement as the ice is driven by the wind. This would involve the use of offshore remote weather stations. Those are not going to be in place for 1976.



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Q I take it, though, the state of the art exists that if fully applied it could be a significant factor in dealing with the risks that you speak about?

A Yes, it could be because one of the difficult parts of prediction of weather and ice movement in this area is a lack of offshore weather information and secondly, the development of a fine grid prediction. I don't know whether I made myself clear there, but the -- the weather predicting services, generally involves the computerization over a very coarse grid so that the information you've got really isn't as applicable to a small area as it would be if you had developed a small scale prediction system.

Q Now sir, as was said this morning you're aware that Canmar has prepared comments on your paper. You're familiar with them, I take it?

A Yes, I have reviewed them in the past. I'm not familiar with precisely what's in them at the moment.

Q They were prepared following the release of your preliminary assessment in November of last year?

A Yes, that was the first unpublished version.

MR. EVANS: Excuse me, Mr. Goudge. I have a copy of that that I can give to the witness.

MR. GOUDGE: Yes, I would like to have this filed sir. It constitutes a number of



1 pages of comment by Canmar. I would propose that it be  
2 filed as an exhibit, and I would like to go through  
3 some parts of it at least with Mr. Milne and get his  
4 comments on it.

5 THE COMMISSIONER: Yes, and I  
6 would like the paper by A.E.R.S. on the sea ice --

7 MR. GOUDGE: Movements.

8 THE COMMISSIONER: -- to be  
9 filed as well.

10 MR. GOUDGE: Yes. Now, if you  
11 have a copy of the Canmar comments in front of you, Mr.  
12 Milne, you'll see that on page one or page two -- well  
13 page one of the comments, they say that the Canmar  
14 equipment will be of a higher standard and the precautions  
15 taken in the Beaufort Sea will be greater than anywhere  
16 in the world. Do you agree with that?

17 A This is the Canmar equip-  
18 ment are you referring to the -- could you point out  
19 exactly where that is?

20 Q It's on the first page of  
21 the Canmar document in the middle of the first para-  
22 graph.

23 A Oh, yes. I can't confirm  
24 or deny whether that's the case.

25 Q Then on page two of the  
26 document, they speak of, at the bottom of the page, the  
27 drill ships incorporating all of the most modern but  
28 proven drilling equipment and being specially designed  
29 for the Beaufort Sea ice environment. These, I take it,  
30 are the ice protection features of the ships that you





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1 spoke about?

2 A That's true.

3 Q Can you tell us, in general  
4 terms -- I take it thickened hulls are one of the  
5 features?

6 A You would like me to  
7 describe these?

8 Q Yes, what are the features  
9 that are --?

10 A Well, there are -- there are  
11 three, if I recall, three main features. That is the  
12 ice strengthening of the vessel, the drill ship itself;  
13 internal strengthening as well as an ice protecting belt  
14 around the outside. Secondly, it has the anchoring  
15 system which keeps it in place, has it's hawse pipes  
16 underneath the vessel instead of the normal way from the  
17 upper deck and outward. This is to prevent the entangle-  
18 ment of the anchoring system with encroaching ice.

19 Thirdly, the -- it has a system  
20 of thrusters which are an internal thruster much like  
21 bow thrusters on vessels for maneuvering which provide  
22 a system where the propulsion system for small movements  
23 is protected from ice. Also it does -- they do allow  
24 for rapid disconnect of the anchoring system and recon-  
25 nection if intruding ice should occur. I think those  
26 are the main features that I recall.

27 Do those features, in your view  
28 significantly lengthen the drilling season?

29 A It is -- I don't know just  
30 how much Canmar is banking on being able to lengthen the



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1 duration of the operating season, because of these  
2 features. I think -- my understanding is they are the  
3 ice belt and the capability of resisting ice is more of  
4 a safety feature rather than a feature which would permit  
5 them to extend the operating season.

6 Q Now, one of the features  
7 of the Canmar drilling program, I take it, is that there  
8 may be some difficulty in reaching the ultimate depth  
9 in one drilling season. Is that your understanding of  
10 the Canmar proposal?

11 A Yes, this would appear to  
12 be the case in 1976 because they claim they need some-  
13 where of the order of between 100 and 120 days operating  
14 time and experience shows that ships do not generally  
15 get into the Beaufort Sea until somewhere near the first  
16 of August. Then of course, the ice season terminates  
17 somewhere about the middle of October, not simply because  
18 the ice has disappeared offshore, but because you have  
19 to get back to your overwintering harbour.

20 Q While it doesn't come  
21 from the Canmar document, let me ask you what relevance  
22 there is to risk of having to go back a second year and  
23 locate the initial hole to complete the drill?

24 A The only relevance to  
25 environmental risk is the problem of the blowout and the  
26 necessity to get back to that site in the following year  
27 and in that event, then the intrusions of ice would  
28 certainly prevent the ship from getting back on site.  
29 It has been sort of the general philosophy of mine in  
30 the assessment is really to concentrate on the environ-



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1 mental damage relative to not getting back on site and  
2 the problem of -- problems associated with that, rather  
3 than to be worried about Canmar's technical problem,  
4 which is really of their direct concern.

5 Q Now, in connection with  
6 this business of frequency of blowout which has been  
7 canvassed probably as thoroughly as we can, let me ask  
8 you simply to comment on one proposition that Canmar  
9 makes and that is that any statistics relating to risk  
10 must take full account of the fact that 63% of blowouts  
11 close off naturally and need no relief well.

12 A Yes, this is the -- that  
13 illustrates the problem of trying to look at the problem  
14 statistically. Of the three major -- well, the three  
15 oil well blowouts which have occurred off the --  
16 in the Gulf of Mexico and off Santa Barbara, two of these  
17 were of major proportions and also at the same time,  
18 one has to look at the problem of relief well drilling.  
19 That a relief well -- one relief well often does not do  
20 the trick, that sometimes it take more than one relief  
21 well to stop off a well. Other times the wells bridge  
22 themselves. There happen to be a multitude of statistics  
23 available on the occurrences that have -- of gas well  
24 blowouts, how they bridge themselves, at what depth they  
25 occur, and so on. It's clear every situation is different.

26 Q And you've told us that  
27 for those reasons and others you're very dubious about  
28 putting any risk factor on a blowout. But, let me ask  
29 you to agree with the general proposition that the  
30 history of blowouts closing themselves naturally is a





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1 history which tends to reduce whatever risk there may  
2 be.

3 A This is true. There is  
4 a possibility of reducing the risk here.

5 Q Yes. Now, on page five  
6 of the Canmar document, sir, paragraph B, if you'll turn  
7 to it, contains Canmar's proposition that relief well  
8 drilling is faster than the original well because the  
9 drilling characteristics of the formations are known and,  
10 more importantly, any hydrocarbon bearing zones have  
11 been identified. That's a quotation. You say in your  
12 paper that relief well drilling will probably not be  
13 any faster. Could you comment on the Canmar proposition,  
14 please?

15 A In my judgement, I was  
16 being conservative there because -- we've also pursued  
17 this question in depth with Canmar, subsequent to their pro-  
18 duction of this document and they felt that, in their  
19 judgement, that it would take about the same time and  
20 the reason for this is that you have to stop and log  
21 your well more frequently because your directional drill-  
22 ing you have -- you have a target to make whereas when  
23 you're drilling the first well, you do not have a target  
24 to make you're just going to depth, so in my judgement  
25 it would probably take about the same time if you had --  
26 if you were doing it properly the first time. But if  
27 you miss, then it would take longer.

28 Q And do I understand you to  
29 say that that is now Canmar's judgement as well?

30 A Yes.



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Q Then on page seven of the Canmar document, there is reference made to their contingency proposal relating to burning at the blowout site. The following comment is made on your paper:

The draft summary assumes that burning of oil and gas at the blowout site will not likely be successful because of wind, wave and ice action. We contend that it is merely a matter of opinion at this stage and that further research is required, but there is a strong likelihood from past experience that burning will be quite successful. We refer, for example to the Amoco gas blowout which occurred in Cook Inlet in Alaska in the mid-sixties which burned all winter long from a depth of about a hundred feet below sea level where the currents are very high and considerable ice movement existed over the site".

That's the end of the quote. You seem to have a difference of opinion there, I wonder what your comments are on the Canmar proposition?

A Yes. First of all, there has been no experimental work done to determine the efficiency of burning oil on top of cold water. That's first of all. So, I would agree that it is not <sup>based</sup> on fact. However, the information that I got from the Environmental Protection Service in Burlington as to their experience in trials, was that it has been -- I just recall, but I can't recall precisely the circumstances, however, it goes something like this, that when oil spreads on cold water, it's very difficult to bring this otherwise



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1 combustible material up to the flash point and gas will  
2 burn as it emerges. However, this is no certainty that  
3 the oxygen that is used by the gas or that the gas  
4 certainly heat up the water in the vicinity of that oil  
5 if the water is moving. So, the problem is with bringing  
6 the oil up to the flash point so that it will burn.  
7 The guess is that when you're sort of in wind-waves and  
8 winds above about 13 knots that this is very unlikely  
9 occur, that you can burn off that oil. Or that it will  
10 remain in it and remain alight.





A.R. Milne  
Cross-Exam by Goudge

1 Q So, I take it you would  
2 agree with Dr. Snow who told us that the burning of  
3 emulsified oil first was impossible or at least very  
4 difficult. The burning of oil on top of cold water was  
5 as well very difficult.

6 A Yes. I think that if you  
7 have calm water the chances are quite good, burning off  
8 the oil from blowout ; relatively calm.

9 Q Provided you get to it  
10 quickly.

11 A Yes, because in relatively  
12 calm water there is the development of a wave ring which  
13 provides some containment for the oil and therefore the  
14 oil is thick enough that it could get warmed up and reach  
15 the flash point, and therefore burn and maintain burning.

16 Q Is it so, though, that the  
17 speed with which you get to it , to ignite it is also a  
18 factor as to how well it will burn, because of the weather-  
19 ing effect?

20 A Yes, there is also the  
21 possiblility that if the blowout occured in calm water  
22 that it would be on fire to begin with and certainly if  
23 it is extinguished, then returning to the site would be a  
24 factor.

25 Q Yes. Now on page seven and  
26 eight of the Canmar document beginning at the bottom of  
27 page seven--

28 MR. GIBBS: Mr. Commissioner,  
29 I wonder if my friend is going to go through page by page  
30 and paragraph by paragraph of a document put forward by a



A.R. Milne  
Cross-Exam by Goudge

1 party who's not represented at the hearing, to be refuted  
2 ed by a person who really has no experience in these  
3 matters, it seems to me, sir, and it's my submission that  
4 it would be only fair to ask Canmar to have the opportunity  
5 to speak to their own document and support what they  
6 have said in it.

7 MR. GOUDGE: Well, sir, I had  
8 wondered about the utility of getting Mr. Milne's comments  
9 on these when I prepared these and my view is respectfully  
10 that it will be useful to you to have his comments on  
11 their position. I would like to consider the possibility  
12 and I would be quite-- I'm in your hands as to the  
13 possibility of taking the transcript that results from  
14 this and providing it to Canmar  
15 and offering them the opportunity of dealing with it  
16 should they feel it necessary.

17 MR. BAYLY: I have no objections  
18 to that; to either Commission counsel or one of  
19 these applicants calling the Canmar people if they feel  
20 that that would be fair to the industry.

21 MR. GIBBS: It's not a matter  
22 of us calling them. I think it's just a matter of fairness.  
23 This man has just given evidence on whether oil  
24 will or will not burn with no background on what experience  
25 he has in these matters, and after all it is a  
26 very substantial, very expensive, very important project  
27 which Canmar's put forward, and I think in all fairness  
28 they should be given that opportunity.

29 MR. GOUDGE: Well I'm not  
30 so interested in fairness to Canmar, Mr. Commissioner,



A.R. Milne  
Cross-Exam by Goudge

1 but I am interested in completeness and it seems to me  
2 that it's important that you have before you such evid-  
3 ence as is available in this relatively frontier area,  
4 and from that point of view I think there may well be  
5 some merit in at least providing Canmar with the comments  
6 that have been made to date, and asking if they wish the  
7 opportunity to add to it in any way. I don't propose to  
8 undertake to do that until I have a chance to review what  
9 Mr. Milne has said in answer to my questions.

10 MR. MARSHALL: I think it's my  
11 turn, Mr. Commissioner. I agree with Mr. Gibbs that if  
12 this subject is going to be dealt with in this way that  
13 really justice would require that Canmar have an opportuni-  
14 ty to speak to it. This Inquiry's proceedings are widely  
15 broadcast and it may be that Canmar could be seriously  
16 affected by something said here, in their absence and with  
17 really no opportunity to respond.

18 I'd like to comment really on, I  
19 think, a more central issue, and one raised by Mr. Goudge,  
20 and that is of completeness. With respect, sir, I think  
21 that we're really going into far too much detail on the  
22 technical aspects of the Canmar proposed operation, which  
23 is the subject matter of another review. Now, it's inter-  
24 esting, indeed very interesting to have some idea of what  
25 may possibly take place in the Beaufort Sea at some date  
26 in the future but with respect, the terms of reference of  
27 this Inquiry don't require that we go into a detailed  
28 analysis of the use bow thrusters in the Canmar drilling  
29 ships, how the anchoring system works and matters of that  
30 sort. I think we've gone way too far in that direction and





A.R. Milne  
Cross-Exam by Goudge

1 Commission counsel , I think is leading us off in a tan-  
2 gent that's not really going to assist the long-range  
3 goals of this Inquiry.

4 THE COMMISSIONER: Well, the  
5 difficulty is this; Canmar or Dome-- Dome wants to carry  
6 out this experimental drilling. They have already received  
7 approval in principle. That entails a risk that it is for  
8 the Minister, perhaps the Cabinet to assess, and we have  
9 been told that an assessment was made back in 1973, and  
10 they decided it was acceptable, so that's the end of the  
11 matter, as far as the Inquiry's concerned. We are consid-  
12 ering whether given a proliferation of exploration and  
13 development activity in the delta and the Beaufort Sea  
14 there would be an impact that would -- an impact that  
15 bears on the usefulness of the terms and conditions  
16 that this Inquiry may recommend with respect to an oil  
17 pipeline, <sup>and</sup> the establishment of an energy corridor.

18 The only examination of the  
19 impact of drilling activity in the Beaufort Sea is the  
20 examination carried out by Mr. Milne's group. It is no  
21 doubt going to be of great assistance to Mr. Buchanan  
22 and Mr. Marchant in developing the terms and conditions  
23 under which Dome is to be allowed to proceed, and Dome  
24 is no doubt being heard by those two ministers and their  
25 advisors, so that insofar as their own legal rights are  
26 involved, they are under consideration by those two  
27 Ministers, who I have no doubt, have made -- who I have  
28 no doubt have taken every step to ensure that they hear  
29 what Dome has to say.

30 At the same time, the work that



A.P. Milne  
Cross-Exam by Goudge

1 Mr. Milne's group has done is the only work that relates  
2 to the long-range impact and he makes the point, as he  
3 did last week when he was here that if you multiply  
4 the number of wells, you multiply the probability that  
5 he has-- that has been -- is to be found in the literature  
6 or the probability that he and his colleagues used. If  
7 you multiply that by the number of wells drilled then  
8 you will have something like a reading of the long-range  
9 risk.

10 That is nothing to do with Dome,  
11 so far as this Inquiry is concerned. Dome happens to have  
12 been the first horse into the field, but we are concerned  
13 about what the results will be if there are many horses  
14 entered.

15 So, all through this I'm inclined  
16 to agree with Mr. Marshall from time to time, that we've  
17 gone into some details of technology that aren't really  
18 of much assistance because, over the long range, that  
19 technology will likely be altered, in some particulars  
20 that can be considered at a future time. What I'm  
21 essentially saying is that I don't think that it is  
22 necessary at all, to bring Dome into this Inquiry, be-  
23 cause their rights are not at stake and this Inquiry has  
24 not been asked to report to the Minister with regard to  
25 Dome's proposed experimental wells. I don't think that  
26 there is any unfairness to Dome in adopting this proced-  
27 ure.

28 The problem though, that Mr.  
29 Marshall has raised is one that I sympathize with. I  
30 appreciate your seeking to be complete, Mr. Goudge, but



A.R. Milne  
Cross-Exam by Goudge

1 the areas where Dome suggests the risk is not as great  
2 as Mr. Milne's group has outlined, and where they suggest  
3 the consequences would not be as severe as Mr. Milne's  
4 group has outlined, it seems to me, those should be  
5 brought forward. That, it seems to me, is what ought to  
6 be done in fairness to the Inquiry. But I don't think  
7 that these details regarding the construction of vessels  
8 and so forth, are particularly helpful.

9 MR. GOUDGE: Sir, that guidance  
10 on the three more areas, all of which I submit are rel-  
11 event to you.

12 The first has to do with what is  
13 a comment that Canmar makes on Mr. Milne's report con-  
14 cerning his thesis of ice movement rates. That is clearly  
15 something of general application. Secondly there are  
16 comments in the Canmar document concerning the potential  
17 contamination of leads from an oil spill, from the point  
18 of view of aquatic wildlife, and finally the same as  
19 concerns the impact -- possible impact on birds, and those  
20 in my submission would be of general application and I  
21 would propose to go into them with your permission, sir.

22 THE COMMISSIONER: Well, I  
23 think we should. Before you do, I gather that, to a very  
24 great extent, where the knowledge and experience of your  
25 own group did not extend beyond biological and oceanograph-  
26 ic considerations, you went to the industry and sought to  
27 obtain a substratum of experience from them that you  
28 could build on. Is that right or--

29 A Yes, that's true. We've  
30 been in quite regular consultation with A.P.O.A. and





A.R. Milne  
Cross-Exam by Goudge

1 Mr. John Hnatiuk, of Gulf Oil has been the industry pro-  
2 ject manager and so there has been an opportunity for  
3 continuous consultation. Not only that , it has been, I  
4 think, of benefit to Canmar to have had the project in pro-  
5 cess and be able to consult with the investigators on all  
6 aspects of the development of their own contingency plans.

7 THE COMMISSIONER: Yes. You  
8 said Mr. Hnatiuk was the manager for the industry side of  
9 the project. He represented the industry, not Dome, I  
10 take it.

11 A That is correct.

12 Q And did Mr. Hnatiuk and the  
13 members of the industry side of the project collaborate in the preparat-  
14 ion of the report or do they dissent from it?

15 A No, that was not their  
16 responsibility. It's the Department of the Environment  
17 responsibility to produce and report on the project.

18 Q So that Mr. Hnatiuk and  
19 his industry colleagues would not in any way be-- should  
20 not in any way be taken to subscribe to what is in your  
21 report.

22 A No, that's true.

23 MR. GOUDGE:

24 Q Mr. Milne, coming back to  
25 pages seven and eight of the Canmar document, Canmar makes  
26 comments there as to the movement of the pack ice, and  
27 to begin they say that in their view , 1974, I suppose  
28 was a most unusual year and velocities were much above  
29 normal.

30 A I don't know about that



A.R. Milne  
Cross-Exam by Goudge

1 point but I would agree that it was a most unusual year  
2 in 1974.

3 Q In terms of velocity of  
4 movement of the pack ice?

5 A No, I would not agree that's  
6 necessarily true.

7 Q Canmar refers to 1972  
8 experiments conducted by Sun Oil that showed over a per-  
9 iod of about two months, ice movement being estimated at  
10 less than 15 kilometers. I take it, that is far below  
11 the rates that you speak of as the generalized movement  
12 rates of the pack ice, and I wonder if you're familiar  
13 with the study and have any comment on it's conclusion.

14 A I'm not familiar with that  
15 -- with the Sun Oil study, however I could make further  
16 comments if required.

17 Q Do you have any that you--

18 THE COMMISSIONER: Excuse me,  
19 if you'll let me just add to what I said because what I  
20 said must have sounded lawyer-like. I hope it did because  
21 /it's the way to dispose of a question like, but just bear in  
22 mind that Mr. Milne disposed summarily of two gentle-  
23 men named Campbell and Martin who'd constructed a theory  
24 about the impact of oil on the world's weather system,  
25 and Dome is in the same position as Campbell and Martin.  
26 The views they've expressed, the studies they've carried  
27 out may be commented on here but their rights are not  
28 under consideration, any more than Campbell and Martin's  
29 are.

30 Well, excuse me, carry on.



A.R. Milne  
Cross-Exam by Goudge

1 MR. GOUDGE:

2 Q Do you have any further  
3 comments to make, sir, on the proposition that Canmar  
4 makes that -- you said you might have further comments.  
5 If you do please--

6 A I think, my main comment  
7 here is to really throw the ball back to a certain extent  
8 because the variability from year to year is extensive  
9 and a measurement made over a short period of time does  
10 not necessarily represent a picture which describes the  
11 long-term average movement, simply because the movement  
12 offshore depends of the prevalence of onshore or offshore  
13 winds. With offshore winds there's a slackening of the  
14 pack. Movement can proceed faster. With onshore winds the  
15 reverse is true, in fact you can get periods of motion-  
16 less ice offshore which will last for days.

17 Q Yes. Then, sir, both on  
18 page six and page eight of the document, Canmar goes  
19 through calculations relating to the coverage of open  
20 leads with oil from a spill, and if I summarize it fairly  
21 it draws the conclusion that wildlife will, in general  
22 suffer less damage than you predict because much of the  
23 leads will remain open and uncovered by oil. Would you  
24 agree that that's a fair summary of your understanding of  
25 those two parts of the Canmar report?

26 A Yes, I think that the gen-  
27 eral tact, again this is my opinion--the general tact  
28 taken here was that the quantity of oil which would make  
29 a trail off to the westward in my scenario, is quite  
30 small and when you take account of the area of the south





A.R. Milne  
Cross-Exam by Goudge

1    ern Beaufort Sea, compared to the area of contamination  
2    if you assume a given thickness of oil, then it's extrem-  
3    ely small. That is true.

4                   The point I was trying to make  
5    in my document was that while small, it's precisely where  
6    it should not be, and as well as that, is that the ice  
7    melts faster where the oil is in the springtime and can  
8    become a good target for sea birds to reach, because they  
9    are mobile. It's the mobility of the animals which deter-  
10   mines the threat and not the quantity of oil , to the  
11   same extent, that is.

12                   Q     And you would apply that  
13   view to the threat, both to aquatic wildlife and to birds  
14   insofar as leads are utilized?

15                   A     Yes, because the animals  
16   are mobile and they are moving from lead to lead. They're  
17   moving from position to position, so a statement has  
18   been made that the marine mammals will-- a certain  
19   percentage of them are likely to encounter oil. The  
20   birds, if they encounter oil, well they've had it, but  
21   again there's a fraction of the birds which are likely  
22   to encounter oil, those are in offshore migration; so  
23   I think we get into the problem of guesses and opinion  
24   but I had the advantage of having to consult the people  
25   who had been on the stand before-- Tom Barry-- on the  
26   habits of birds offshore , and we did, I think, put it  
27   in perspective, because if you accept the statements by  
28   Canmar here , it is true the area is small, compared to  
29   the overall contamination. There's no doubt about that.

MR. GOUDGE:           Thank you, sir.



A.R. Milne  
Cross-Exam by Goudge

1 I have no more questions, of Mr. Milne.

2 THE COMMISSIONER: Any re-  
3 examination.

4 MR. BAYLY: No, Mr. Commission-  
5 er , I have no re-examination of Mr. Milne, and with two  
6 exceptions, sir, that completes the evidence that COPE  
7 wishes to call, in this delta portion, or phase or what-  
8 ever we're calling it, of the Inquiry, and those two  
9 exceptions are, (1) the panel that we had proposed would  
10 go on, including Dr. Usher, and Mrs. Cournyea . We haven't  
11 made any decision about that at this point. The other  
12 one is the evidence of Mr. C.W. Nickle of the Environ-  
13 ment Canada, and he's presently in Japan and we would  
14 propose to call his evidence towards the end of March or  
15 early in April. It fits into this phase in many ways, but  
16 it would also be a proper subject for phase three, I  
17 believe. We would be distributing his evidence as soon  
18 as he returns and can compile it.

19 I have here a pamphlet that he  
20 has published, which contains the subject matter of his  
21 evidence, but it won't be his evidence. I'll be happy to  
22 make that available so that the counsel will know what  
23 it will contain.

24 THE COMMISSIONER: Fine.

25 MR. GOUDGE: Sir, we were  
26 proposed to follow this with a panel of two witnesses,  
27 whose summaries have been distributed. Perhaps we could  
28 break for coffee and reconvene, with that panel.

29 THE COMMISSIONER: Thank you  
30 very much, Mr. Milne. We certainly have learned greatly



Speller, Inglis  
In chief

1 from your assistance at the Inquiry, and I certainly found  
2 it interesting but also extremely helpful and thank you  
3 again, sir.

(WITNESS ASIDE)

4 (PROCEEDINGS ADJOURNED AT 3:40 P.M.)

5 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

6 S. WAYNE SPELLER  
7 JULIAN T. INGLIS, sworn:

8 MR. GOUDGE: Sir, if we could  
9 reconvene, the panel before you consists of Mr. Julian  
10 Inglis, on your right and Dr. Wayne Speller on your left.  
11 Their prepared evidence has, I think, been circulated  
12 and I think you have a copy, sir. I would like to begin  
13 by qualifying each of them, and then proceed, perhaps  
14 with, given the hour, the reading, at least of Dr. Speller's  
15 evidence, and we'll see perhaps how we come along.

DIRECT EXAMINATION BY MR. GOUDGE:

16 Q Let me begin with you, Mr.  
17 Inglis. You got your Bachelor of Science degree in zoolo-  
18 gy from Aberdeen University in 1967. Is that correct?

19 WITNESS INGLIS: That's correct.

20 Q And your Master of Science  
21 in biology with distinction from Carleton University in  
22 1975?

23 A That's correct.

24 Q And your employment history  
25 begins in 1967 and '68 when you were a teacher in the  
26 Science Department of Peterhead Academy in Scotland?

27 A Yes.

28 Q And in 1968 you began as  
29 an organization -- began organization and participation  
30 as a biologist of small mammals and reptiles on the





Speller, Inglis  
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1 Aberdeen University expedition to North East Afghanistan.

2 A That's correct.

3 Q And thereafter you spent  
4 two years as assistant manager and range biologist, Canadian  
5 ian Reindeer Project, Canadian Wildlife Service here in  
6 Inuvik.

7 A That's correct.

8 Q And following that, over the  
9 next two years, as a range biologist first in the Arctic  
10 Island Range Studies for the Canadian Wildlife Service,  
11 and then as a range biologist, vegetation and land forms  
12 of winter range, reindeer grazing reserve, N.W.T., for  
13 the Canadian Wildlife Service.

14 A That's correct.

15 Q And for the last three years  
16 and up to the present you've been land management biologist  
17 and acting head, Land Management Section, Water,  
18 Forests Lands and Environment division of the Department  
19 of Indian Affairs and Northern Development, in Ottawa.

20 A That's correct.

21 Q And in particular, you were  
22 involved in the assessment of granular materials and their  
23 availability in relation to demand in the Mackenzie Delta  
24 area which was a project under the auspices, I think, of  
25 the Department of Indian Affairs and Northern Development.

26 A That's right.

27 Q Yes. Now, Dr, Speller,  
28 turning to you, sir, you're curriculum vitae is at the  
29 beginning of your prepared evidence and could we simply  
30 begin with you sir, and have you read your curriculum



Speller & Inglis  
In chief

1 vitae and then continue on with your evidence?

2 WITNESS SPELLER: Yes. My  
3 university education began at the University of Victoria,  
4 in Victoria , B.C. where I received a B.Sc. degree in  
5 biology. I studied for my M. Sc. at Carlton University  
6 in Ottawa, the topic of my thesis centering on the habitat  
7 selection of small mammals.

8 My experience in the Arctic  
9 began in 1967, when I started a Ph. D. thesis on the  
10 food ecology and hunting behavior of denning Arctic foxes.  
11 The study took place in the central district of the  
12 Keewatin, a low Arctic tundra biome. After completing this  
13 research in 1970, I joined the IBP research study on  
14 Devon Island where I studied the ecology of lemmings in  
15 this high Arctic tundra biome during the summer of 1971.

16 In the spring of 1972, I joined  
17 the Canadian Wildlife Service as a wildlife biologist.  
18 During the two years and nine months I worked for the  
19 organization I lived in both Whitehorse and Yellowknife.  
20 I served as the wildlife advisor to the Department of  
21 Indian and Northern Affairs on the Land Use Advisory  
22 Committees of both Territories and the Arctic Waters Oil  
23 and Gas Advisory Committee in Yellowknife.

24 In dealing with the responsibil-  
25 ities of mitigating the impacts of all types of develop-  
26 ment activities on birds and mammals throughout both  
27 Territories, I relied heavily on the experience of north-  
28 ern research scientists and biologists. My experience with  
29 activities associated with northern exploration and dev-  
30 elopment operations was gained from practical experience



1 and frequent communication with industry representatives  
2 and government resource managers. The advice and recommen-  
3 dations I prepared were based on these inputs plus my  
4 own experience in the north.

5 In January 1975 I joined the  
6 Environmental Assessment Section of the Department of  
7 Indian and Northern Affairs. I have been closely associat-  
8 ed with reviews of all submissions provided by the three  
9 Mackenzie Delta Gas Development proponents. I am also  
10 familiar with the Mackenzie Valley Pipeline proposal  
11 through the delta and the Canmar offshore drilling propos-  
12 al.

13 Q Now, sir, could you commence  
14 with the reading of your evidence?

15 A Thank you.

16 My assignment to this Inquiry  
17 is to provide evidence concerning the effects of all  
18 developments proposed for the Mackenzie Delta and adja-  
19 cent regions and their accumulative impacts on wildlife.  
20 I am aware that evidence has been presented earlier on  
21 the characteristics of the wildlife species which occur  
22 in the Mackenzie Delta and that descriptions of the  
23 various proposed developments have been given along with  
24 assessments of the magnitudes of the various types of  
25 impacts that can be expected on various species of  
26 wildlife.

27 For the record, the developments  
28 which I wish to include are: the Mackenzie Valley Pipe-  
29 line, three proposed gas development systems, onshore  
30 exploration drilling, nearshore or artificial island





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1 exploratory drilling, offshore exploratory drilling, in-  
2 volving drill ships, the Dempster Highway completion,  
3 and the proposed Inuvik to Tuktoyaktuk Highway.

4 I shall not attempt to describe  
5 all of the impacts to wildlife which may occur as a result  
6 of these developments, nor shall I attempt to rate the  
7 magnitudes of all of these impacts. Rather I wish to draw  
8 to your attention some of the major disruptions to wild-  
9 life which are, in my opinion either unavoidable or inevit-  
10 able. I also wish to provide some recommendations which  
11 I believe could mitigate these impacts as well as some  
12 considerations for future wildlife management in the  
13 delta and adjacent regions.

14 Regarding impacts to wildlife;  
15 aircraft. A great deal has been said about aircraft  
16 activities that will be associated with pipeline construct-  
17 ion and the types and magnitudes of impacts that can be  
18 expected for various wildlife species. But a lot has been  
19 left unsaid in relation to what is predicted in aircraft  
20 activity and what actually takes place. In my experience  
21 with onshore and nearshore petroleum exploration, aircraft  
22 activity associated with recent drilling and seismic  
23 operations tends to run in an organized, consistent man-  
24 ner, due to the northern experience gained by the con-  
25 tractors. Despite this experience accidents, breakages,  
26 forgotten equipment, visits by company officials, not to  
27 mention government inspectors and officials, contribute  
28 significantly to the basic level of aircraft activity.

29 During construction of the pipe-  
30 line, summer pipelining operations and construction of



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1 the Shell and Imperial gas plants will add to the air-  
2 craft requirements for ongoing onshore and nearshore  
3 exploratory operations in the outer delta. The contractors  
4 and subcontractors for the major developments will be  
5 for the most part inexperienced with northern conditions  
6 and faced with the time and financial constraints and a  
7 very limited access to the project sites, they cannot  
8 be expected to co-operate extensively on the co-ordination  
9 of transportation facilities. Furthermore the petroleum  
10 companies cannot be expected to co-ordinate either inter-  
11 company or intra-company aircraft transportation on pro-  
12 jects of this scale.

13 In short I expect a proliferation  
14 of aircraft in the delta on full-time charter to project  
15 contractors. Additional aircraft will be demanded to satisfy  
16 the requirements of government inspectors and officials,  
17 not to mention parties indirectly associated with or  
18 curious about the development projects.

19 In my opinion the activities of  
20 waterfowl populations in the outer delta could be seriously  
21 disrupted by the magnitude of such aircraft activity.  
22 Aircraft operating out of Shell's Farewell Camp; the  
23 Niglintgak plant and associated well pads and docks; the  
24 Taglu airstrip and dock; and the camps and pipeline  
25 operations in the Shallow Bay area will affect nesting,  
26 brood rearing , moulting , feeding and staging waterfowl.

27 All proponents have suggested  
28 that air corridors and flight elevation should be estab-  
29 lished to minimize aircraft disturbance. No doubt these  
30 will help for flights directly associated with company



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1 projects. But what of the multitude of unrelated com-  
2 pany flights what agencies or bodies will be responsible  
3 for establishing a master plan for air corridors and  
4 operating conditions for all projects, and what agency  
5 or body will police it?

6 One final consideration. A pilot's  
7 first responsibility is always to his passengers and air-  
8 craft and when he is faced with the uncertainties such as  
9 weather or heavy air traffic he will, if necessary, break  
10 regulations. For example, foggy conditions prevail in the  
11 delta in May and early June, as well as during the fall.  
12 If aircraft can legally operate in fog and land under  
13 low cloud conditions given adequate landing site and  
14 aircraft instrumentation. However, under low cloud con-  
15 ditions and heavy air traffic there are few living light  
16 aircraft pilots who will obey a regulation for a 1,500  
17 minimum elevation over a waterfowl nesting area when the  
18 cloud ceiling is only 500 feet. In other words, there is  
19 a conflict between air traffic regulations and operating  
20 recommendations established to protect wildlife. There is  
21 a requirement for the co-ordination of all aircraft  
22 activities throughout the Mackenzie Delta and adjacent  
23 regions, and the establishment of air traffic regulations,  
24 which incorporate wildlife interests.

25 Air cushion vehicles; the oper-  
26 ation of air cushion vehicles in areas occupied by water-  
27 fowl populations is also a potential problem requiring  
28 co-ordination and regulation. The high speed versatility  
29 and operating noise level of these vehicles over deep and  
30 shallow water and low-lying floodplain terrain creates





Speller & Inglis  
In chief

1 potential conflicts with waterfowl activities throughout  
2 the delta. Within migratory bird sanctuaries operations  
3 of these vehicles can be regulated under existing legis-  
4 lation. However, outside of the Kendall Island Sanctuary  
5 critical waterfowl habitat exists where the operating  
6 conditions for these vehicles can only be recommended  
7 rather than regulated to protect wildlife interests.

8 To date, I am personally not  
9 aware of any complaints concerning waterfowl air cushion  
10 vehicle interactions. However, I am concerned that <sup>the</sup> num-  
11 ber of these vehicles will increase during pipeline and  
12 gas plant construction operations, and I believe that  
13 operating corridors and regulations should be developed  
14 to prevent any future problems.

15 Hydrocarbon pollution: Inform-  
16 ation has been provided on fuel quantities, storage lo-  
17 cations, risks of spills in the delta, and the various  
18 consequences for local wildlife. For the sake of conven-  
19 ience hydrocarbon pollution can be divided up into three  
20 categories: an uncontrolled oil blowout at an offshore  
21 well, a major fuel-oil spill - example: the magnitude of  
22 a fuel barge rupture or the equivalent of a 100,000 gal-  
23 lon plus tank burst, and finally a minor fuel spill.  
24 I do not wish to enter discussions of the statistical  
25 probability of such pollution occurring, however I do  
26 wish to outline the potential threats to wildlife and to  
27 outline my assessment of the effectiveness of contingency  
28 planning and equipment.

29 The uncontrolled blowout of an  
30 oil well in the offshore or nearshore area of the Beau-



Speller & Inglis  
In chief

1 fort Sea will, in my opinion , have a catastrophic effect  
2 on regional seabird and waterfowl populations. The report  
3 "Offshore Drilling for Oil in the Beaufort Sea", a preliminar-  
4 ary environmental assessment provides, in my opinion,  
5 a valid comprehensive assessment of both the impact of  
6 such a blowout and the lack of effectiveness of the  
7 contingency plan and equipment to control such a blowout.

8 In the outer delta region, in  
9 the area of Kendall Island, the threat of an oil-- fuel  
10 oil pollution to waterfowl will increase significantly  
11 with the proposed development of the Niglintgak and Taqlu  
12 gas plants. The dock unloading sites lie within Kumak  
13 and Kuluarpak Channels respectively, within 12 miles of  
14 Kendall Island. These are both major channels which dis-  
15 charge south of Kendall Island, either side of small  
16 deltaic islands used by snow geese and other waterfowl as  
17 nesting, feeding, brood rearing, and moulting area. If a  
18 major fuel spill occurred in either of these channels, it  
19 is doubtful if sufficient fuel spill containment and  
20 cleanup equipment could be mobilized and placed in  
21 operation before the bulk of this spill entered this area.  
22 Such a spill would have its greatest adverse effect upon  
23 birds during summer, when nesting and feeding areas would  
24 be polluted and the birds themselves would be contaminated.

25 Similar threats to waterfowl  
26 feeding and staging habitats exist in the Shallow Bay  
27 area where fuel storage sites for pipeline construction  
28 are planned.

29 The effectiveness of oil spill  
30 contingency plans are only as good as the equipment, man-



Speller & Inglis  
In chief

1 power training and logistics of which they are composed.  
2 At present the environmental conditions and isolation of  
3 the Mackenzie Delta -Beaufort Sea region provide insur-  
4 mountable obstacles to the effective control and cleanup  
5 of major oil and fuel spills. These obstacles include  
6 minimal amounts of facilities, equipment and manpower to  
7 cleanup spills and limited transportation opportunities  
8 compared with areas in southern Canada or the United States.

9 In the delta, the Arctic Petrol-  
10 eum Operators Association have organized the stockpiling  
11 of petrochemical-spill contingency equipment and under-  
12 taken Manpower training to develop what is known as the  
13 Delta Environmental Protection Unit. However, contingency  
14 planning for the Unit is not co-ordinated for the various  
15 seasonal operations which occur in the delta. Rather it  
16 is the responsibility of each individual company to dev-  
17 elop a contingency plan for its particular operations

18 It is also important to note  
19 that the Delta Environmental Protection Unit will serve  
20 not only ongoing exploration operations, but also the  
21 Canmar offshore drilling operation, the three gas devel-  
22 opment plants and presumably the pipeline construction.  
23 Each of the gas development proposals indicate that the  
24 unit will be associated with their operations, however  
25 the development of equipment, manpower and logistic fea-  
26 tures and the co-ordination of contingency planning remain  
27 unknown.

28 Population expansion and tourism,  
29 I wish to bring your attention a concern for regional  
30 delta wildlife populations which has not been discussed





Speller & Inglis  
In chief

1 in any depth at this Inquiry. This is the impact on wild-  
2 life of the expansion and redistribution of human pop-  
3 ulation, and the potential expansion of the tourist in-  
4 dustry in the Mackenzie Delta area.

5 Construction of the three gas  
6 processing plants, pipelaying operations across delta  
7 channels and the annual barge resupply operations will  
8 involve a much larger number of workmen in the region  
9 during the summer than has been experienced to date. To  
10 date, the disturbance of wildlife by workmen associated  
11 with petroleum exploration has not been a serious problem  
12 due to the large proportion of winter operations, and the  
13 inhospitable weather conditions and low population levels  
14 of wildlife during the winter. In my opinion the level  
15 of disturbance will increase significantly when major  
16 construction begins, especially if small boats and vehicles  
17 are made available to workmen for recreational purposes.

18 Another observation concerns the  
19 activities of workmen during their extended leave periods.  
20 In Alaska, many pipeline workers fly home to their fam-  
21 ilies while the remainder stay in Fairbanks or Anchorage,  
22 both of which are large cities, experiencing difficulties  
23 with the transient population. If Inuvik is subjected to  
24 the transient population pressure, many workmen will take  
25 advantage of local transportation opportunities during  
26 summer to

27 " see the country"  
28 or participate in local fishing and non-resident hunting  
29 opportunities.

30 Workmen wandering about in the



Speller & Inglis  
In chief

construction sites or sightseeing in the delta region, will contribute to the disturbance of wildlife habitats and population. In the delta, development will likely go on for many years, if nearshore and offshore exploration continues to be successful. Construction workers will continue to be required, consequently this element of disturbance can be expected to persist in varying degrees for many years to come.

It is a foregone conclusion that the establishment of suppliers to service pipeline and gas plant construction operations will introduce a large number of temporary residents to Inuvik and other delta communities. In addition the manpower requirements for the operation of the pipeline facilities and the gas processing plants will increase the number of permanent workers and their families living in Inuvik. The contribution of these people plus Federal and Territorial personnel associated with the administration of the resources and the communities will significantly increase the population of the delta region. These temporary and permanent community residents will take advantage of regional recreational opportunities, especially during summer. Small boat travel to the outer delta, for fishing, sightseeing, and hunting opportunities will significantly increase. Critical wildlife habitat will be subjected to limited disturbance but more important, wildlife species populations will be subjected to recurrent human intrusion. In this regard, special consideration must be given to the persistent disturbance of waterfowl populations including critical habitats throughout the summer and



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In chief

1 hunting pressure on snow geese and other waterfowl during  
2 the important fall staging period. Also, the Porcupine  
3 caribou herd in the Richardson Mountains, and the blue-  
4 nose herd in the Anderson River area will receive increased  
5 pressure from hunters taking advantage of the completion  
6 of the Dempster Highway and the relatively cheap aircraft  
7 charters out of Inuvik.

8 At present the tourist industry  
9 in the N.W.T. is limited by a cheap-- by a lack of cheap  
10 transportation. Despite this, the number of tourists per  
11 annum has increased from 600 to 20,000 persons between  
12 1959 and 1972.

13 In my opinion , the completion  
14 of the Dempster Highway and the construction of a high-  
15 way between Inuvik and Tuktoyaktuk will open the delta  
16 region to extensive tourist pressure. The highway offers  
17 a unique opportunity in Canada to drive north of the  
18 Arctic Circle and to dip the wheels of one's vehicle into  
19 the Arctic Ocean. The development of the gas pipeline and  
20 gas processing facilities in the delta, the unique wild-  
21 life--

22 THE COMMISSIONER: It's a  
23 very urban tourist who won't get out of his car.

24 A Yes.

25 THE COMMISSIONER: Sorry,  
26 carry on.

27 A The development of the gas  
28 pipeline and the gas processing facilities in the delta,  
29 the unique wildlife, and other environmental interests  
30 of the region will doubtlessly also attract sightseers.





Speller & Inglis  
In chief

1 Those interested in the environment or development of the  
2 delta will create demand for aircraft and boat transport-  
3 ation. Also many tourists will wish to hike or travel  
4 extensively by canoe or small power boat throughout the  
5 region. A highway linked to Tuktoyaktuk will also provide  
6 relatively easy access to regions east of the delta such  
7 as the Eskimo Lakes, Liverpool Bay and Cape Bathurst.

8 The various pressures on wild-  
9 life species that will result from increased population  
10 and tourism in the delta appear insignificant in them-  
11 selves but when they are accumulated and evaluated in  
12 view of the potential for future expansion of development  
13 in the region, the problems will, in my view , quickly  
14 become the most difficult for wildlife managers to solve.

15 Mitigation of impacts and manage-  
16 ment recommendations for wildlife: In consideration of  
17 the major impacts to wildlife that I believe will result  
18 for aircraft and Hovercraft activities, hydrocarbon spills  
19 and increased population and tourism, I wish to suggest  
20 some recommendations which will mitigate these impacts  
21 through the development of improved operating conditions  
22 and management of wildlife.

23 Operating Conditions: Regarding  
24 the operation of aircraft in areas occupied by wildlife  
25 I indicated earlier that the problem of aircraft controls  
26 stems from the inconsistency between air traffic regulat-  
27 ions and recommendations to protect wildlife interests.  
28 There is therefore the requirement to develop regional  
29 air traffic regulations which afford wildlife the maximum  
30 protection. It is possible that such protection could be



Speller & Inglis  
In chief

1 provided through the notice to airmen or notam, issued  
2 by the Ministry of Transport. This notice system is used  
3 either to eliminate or control aircraft activity in a  
4 defined airspace for a specific time interval. I believe  
5 that regulations through this authority could be developed  
6 to effectively protect wildlife interests in the delta.  
7 However, the full co-operation of industry, wildlife agen-  
8 cies and aircraft operators should be enlisted in the  
9 establishment of such regulations.

10 Similar regulations to protect  
11 wildlife from <sup>air-cushioned</sup> vehicle activities may be es-  
12 tablished through the Canada Shipping Act or Notice to  
13 Mariners also administered by the Ministry of Transport.

14 In reference to the contingency  
15 planning and equipment, manpower training and logistics  
16 associated with oil blowouts and major fuel spills, I  
17 have three recommendations to make.

18 (1) That more research and dev-  
19 elopment be undertaken to improve the effectiveness of  
20 oil spill control and clean-up equipment under Arctic  
21 climatic conditions, especially those which occur in the  
22 Mackenzie Delta and Beaufort Sea.

23 (2) That the operating specifi-  
24 cations for newly developed oil spill equipment, logistics  
25 and manpower training are proven to be feasible under  
26 the climatic conditions in which they are specified to  
27 operate.

28 (3) That contingency planning be  
29 organized on an interdevelopment basis involving all  
30 development activities within the delta area.



Speller & Inglis  
In chief

1 Wildlife management in the delta:

2 Up until now, petroleum exploration and the associated  
3 increase in population in the Mackenzie Delta have re-  
4 sulted in minimal habitat losses and disturbance to wild-  
5 life populations. However, at this point in time, faced  
6 with the prospects of a massive increase in hydrocarbon  
7 development, continued petroleum exploration and major  
8 population expansion resulting from such developments and  
9 the tourist industry, it is time for wildlife management  
10 authorities to exert greater controls for the protection  
11 of wildlife habitat, to minimize disturbance and to  
12 maintain the present level of productivity. The use of  
13 wildlife habitats by industry is already regulated by  
14 government but we must expect that industry will soon  
15 require full control of some tracts of lands which in-  
16 clude critical habitats. Wildlife managers must have  
17 the information necessary to estimate the species prod-  
18 uction losses that may result from the disruption of  
19 these habitats, and if necessary seek compensation for  
20 the losses, such as the development of new habitat in  
21 the region or financial support to increase the product-  
22 ivity of the affected species, elsewhere.

23 Controls of human activities in  
24 critical wildlife habitats will also be required. These  
25 will likely include controls on hunting bag limits, the  
26 timing of hunts, or the areas where hunting is permitted  
27 to take place. The boundaries of existing wildlife areas  
28 may have to be changed and the numbers of people and the  
29 range of their activities in critical habitats may have  
30 to be curtailed. In many cases regulations can be estab-





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In Chief

1 lished under existing legislation to satisfy these re-  
2 quirements, whereas in other areas special status under  
3 legislation such as Parks Canada or the Canadian Wild-  
4 life Act may be required.

5 THE COMMISSIONER: Thank you  
6 very much, Dr. Speller. That was very interesting.

7 MR. GOUDGE: That concludes Dr.  
8 Speller's evidence in chief, sir. I'm in your hands.  
9 It's now 4:30. Mr. Inglis' evidence is about 30 pages  
10 long. You have a community hearing tonight. Do you wish  
11 to proceed to read his evidence in, or do you want to  
12 stop now?

13 THE COMMISSIONER: No, tonight  
14 might be a long night and we wouldn't finish with either  
15 Dr. Speller or Dr. Inglis this afternoon, so why not  
16 adjourn now and we'll start again, I suggest at ten.

17 MR. GOUDGE: I've canvassed  
18 counsel, sir, and subject to what you may say, they  
19 would propose Mr. Marshall only reluctantly, 10:30.  
20 Would that suit you since it might be a late night?

21 THE COMMISSIONER: Right.  
22 All right, we'll adjourn until 10:30 in the morning.

23 (GUIDELINES RELATING TO GEOPHYSICAL ACTIVITIES IN  
THE N.W.T. MARKED EXHIBIT 484)

24 (LETTER FROM MARTELL TO COMMISSIONER MARKED EXHIBIT  
485)

25 (OIL, ICE & CLIMATE IN BEAUFORT SEA MARKED EX. 486)

26 (OIL, ICE IN ARCTIC OCEAN marked EXHIBIT 487)

(OIL SPILLS IN ARCTIC OCEAN MARKED EXHIBIT 488)

27 (COMMENTS BY CANMAR RE BEAUFORT SEA MARKED EXHIBIT  
28 489)

(OFFSHORE DRILLING IN BEAUFORT SEA MARKED EXHIBIT 490)

29 (QUALIFICATIONS & EVIDENCE OF SPELLER MARKED EX. 491)

30 (QUALIFICATIONS & EVIDENCE OF INGLIS MARKED EX. 492)

(PROCEEDINGS ADJOURNED TO FEBRUARY 19, 1976)

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AUTHOR

Canada. Natonal Energy Board

TITLE

Mackenzie Valley Pipeline -  
Inquiry

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GOVERNMENT  
Publications  
MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATION BY EACH OF

(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A  
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS  
CROWN LANDS WITHIN THE YUKON TERRITORY AND  
THE NORTHWEST TERRITORIES; and

(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY  
THAT MIGHT BE GRANTED ACROSS CROWN LANDS  
WITHIN THE NORTHWEST TERRITORIES;

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY  
PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Inuvik, N.W.T.

February 19, 1976

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PROCEEDINGS AT INQUIRY

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Volume 129

CANADIAN ARCTIC  
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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
 Mr. Stephen T. Goudge,  
 Mr. Alick Ryder and  
 Mr. Ian Roland for Mackenzie Valley Pipeline  
 Inquiry;  
 Mr. Pierre Genest, Q.C.,  
 Mr. Jack Marshall, and  
 Mr. Darryl Carter for Canadian Arctic Gas  
 Pipeline Limited;  
 Mr. Reginald Gibbs, Q.C.,  
 Mr. Alan Hollingworth &  
 Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;  
 Mr. Russell Anthony &  
 Pro. Alastair Lucas for Canadian Arctic Resources  
 Mr. Garth Evans Committee;  
 Mr. Glen W. Bell and  
 Mr. Gerry Sutton, for Northwest Territories  
 Indian Brotherhood, and  
 Metis Association of the  
 Northwest Territories;  
 Mr. John Bayly  
 or  
 Miss Leslie Lane for Inuit Tapirisat of Canada,  
 and The Committee for  
 Original Peoples Entitle-  
 ment;  
 Mr. Ron Veale and  
 Mr. Allen Lueck for The Council for the Yukon  
 Indians;  
 Mr. Carson H. Templeton, for Environment Protection  
 Board;  
 Mr. David Reesor for Northwest Territories  
 Association of Municipal-  
 ities;  
 Mr. Murray Sigler for Northwest Territories  
 Chamber of Commerce.  
 Mr. John Ballem, Q.C., for Producer Companys;

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Speller & Inglis  
In Chief

Inuvik, N.W.T.

February 19, 1976

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

S. WAYNE SPELLER:  
JULIEN T. INGLIS, resumed

DIRECT EXAMINATION BY MR. GOUDGE (CONTINUED):

Q Sir, we completed the day yesterday, with Dr. Speller finishing his evidence in chief, and I propose that we begin this morning with Mr. Inglis reading in his evidence in chief.

Mr. Inglis would you like to commence to read your evidence into the record, please?

WITNESS INGLIS: Yes, I'd like to present some information on the cumulative impact of developments on the rock and granular material resources in the Mackenzie Delta area.

In order to fully appreciate the cumulative impact that development might have on the rock and granular material resources of the Mackenzie Delta area, it is necessary to understand the current and projected demand for these materials together with the quantities of suitable material that are presently known to be available. It has long been known that sources of rock and gravel are relatively scarce in the delta, and consequently a considerable amount of time and money is being spent by industry and government to improve our knowledge of the location, quantity, quality and availability of construction materials. Undoubtedly my estimates may not be the most current, but they should form





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In Chief

1 a basis from which one can forecast the nature of  
2 potential impacts and also indicate the sort of planning  
3 and decisions which will have to be made to ensure that  
4 priority uses are established and satisfied.

5 First I would like to sketch in  
6 the demand as I understand it. The present and potential  
7 users can be grouped according to major programs. In  
8 each of these programs I am assuming the worst case, the  
9 maximum potential demand.

10 The groups are: (1) Gas pipeline  
11 construction: trunk pipeline demands as estimated by  
12 Arctic Gas and Foothills. Secondly, gas gathering system  
13 which includes cluster pads, gas plants, staging areas,  
14 airstrips, roads, wharves and so on. (3) Artificial  
15 island construction, which includes islands used in both  
16 exploration and production phases. (4) Staging areas,  
17 (5) On shore drilling pads which includes features  
18 associated with onshore oil and gas exploration. (6) Road  
19 construction and maintenance, which includes present and  
20 proposed programs over the next ten years (7) Townsite  
21 development which includes the development and mainten-  
22 ance of town roads, waste disposal areas, airstrips,  
23 commercial and residential development and so on. (8)  
24 Oil pipelines including feeder lines and trunk lines,  
25 and (9) railroads.

26 I think it would be worthwhile commenting on each of  
27 these in turn.

28 First of all gas pipeline con-  
29 struction: Partial estimates of demand have been present-  
30 ed by Arctic Gas and Foothills for a trunk pipeline.



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In Chief

1 No information has been provided however, on the quantity  
2 or quality of fill required on the pipeline right-of-way  
3 for backfill and for berm construction although these  
4 operations probably account for a large proportion of  
5 the total project demand. The current estimates for pipe-  
6 line and related facilities in the delta are as follows:  
7 In the case of Arctic Gas, Spread A, which extends from  
8 milepost 0 at Richards Island to milepost 133 at  
9 Travaillant Lake, 5,724,000 cubic yards, Spread F, which  
10 extends from milepost 262 (that's the Shingle Point area)  
11 to milepost 329, the delta area, 2,758,000 cubic yards;  
12 spread B which extends from milepost 329 in the delta  
13 to milepost 372 at Tununuk junction, 2,450,000 cubic yards.  
14 The total requirement is then--

15 MR. GIBBS: I hesitate to  
16 interrupt this witness but I wonder, before he goes any  
17 further if he could say where he got those cubic yards  
18 figures. I've been trying to find them in the volumes I  
19 have and haven't been able to isolate them.

20 A Yes, the figures I've just  
21 read out are those presented by Arctic Gas in their cross  
22 -delta amendment which came in<sup>in</sup> the latter part of 1975.  
23 I have also derived corrected figures from last week's  
24 submission, the consolidation filing and I'm just about  
25 to present those in relation to what I've just said.

26 MR. GIBBS: Thank you, sir.

27 A The total requirement is  
28 then 10,932,00 cubic yards. Since I prepared this inform-  
29 ation , Arctic Gas have submitted a third ammendment to  
30 their application, dated January 30, 1976, in the form of



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In Chief

1 a consolidation filing report. The revised figures for  
2 the three spreads I have cited are 5,746,000, 1,570,000  
3 and 2,364,000 cubic yards respectively, for a total  
4 of 9,680,000 cubic yards, or approximately 10 percent  
5 less than the earlier estimates.

6 MR. GIBBS: What was under  
7 spread B again, 2 million?

8 THE COMMISSIONER: Do you  
9 want to go through those again, sir just to let us make  
10 a note of them?

11 A O.K. spread A, the original  
12 requirement was 5,724,000 cubic yards. The revised estim-  
13 ate is 5,746,000 cubic yards. For spread F, the original  
14 estimate was 2,758,000 cubic yards. The revised estimate,  
15 1,570,000 cubic yards. For spread B the original estimate  
16 was 2,450,000 cubic yards . The revised total 2,364,000  
17 cubic yards.

18 THE COMMISSIONER: It's still  
19 the same route. Both are the cross-delta route?

20 A That's correct. The saving  
21 has been achieved by Arctic Gas by modifying the facilities  
22 to be located in the Shingle Point area, in particular.  
23 The saving there amounts to over a million cubic yards  
24 through reduction of compressor pad, airstrip and road  
25 facilities.

26 THE COMMISSIONER: Right.

27 A As far as Foothills are  
28 concerned, 3,135,000 cubic yards of general fill will  
29 be required for the Taglu Travallant Lake section with  
30 an additional 88,000 cubic yards required for concrete





Mr. [unclear]  
In Chief

1 aggregates.

2 To turn to gas gathering systems  
3 some details of the proposed gas gathering systems at  
4 Taglu, Niglintgak and Parsons Lake have been provided in  
5 the respective applications for land tenure agreements.  
6 In volume 3 of the Mackenzie Delta Gas Gathering System  
7 submission, dated 1974, the proponents estimated their re-  
8 quirements as follows: Niglintgak - 350,000 cubic yards  
9 Taglu- 950,000 cubic yards, and Parsons with 3 clusters  
10 developed - 2,025,000 cubic yards. However in the Taglu  
11 Gas Development submission of September 1975, it is  
12 stated that, and I quote;

13 " preliminary conceptual designs require an estimated  
14 1.5 million cubic yards,"

15 which is to say a 50 percent increase on the earlier  
16 estimate. Similarly, at Niglintgak, 800,000 cubic yards  
17 is the present requirement with an additional half mil-  
18 lion cubic yards required for maintenance over the life-  
19 time of the project. At Parsons Lake, the project has  
20 been expanded to include up to six clusters with an  
21 estimated demand of 3 million cubic yards. If a jet  
22 airstrip is included in the final design then 500,000  
23 cubic yards or more would be required in addition to  
24 this quantity.

25 Artificial islands: The first  
26 artificial island, referred to as Immerk B-48, was con-  
27 structed in 1972-73 from material dredged from the sea  
28 floor. Since that time 19 islands have been constructed,  
29 are presently under construction or have been proposed.  
30 Now, I've indicated the location of these islands on the



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In Chief

map which I've pinned up on the wall behind me, if any one would like to refer to that. The total volume of material used in the construction of these islands has not been accurately estimated to my knowledge, but at least 1,000,000 cubic yards have been derived from onshore sources and particularly the Yava Lake esker-kame complex. Other material has been derived from the cannibalization of abandoned islands and from dredging.

There are definite advantages to the company in constructing at least parts of the islands from land based sources. The material is inexpensive and readily accessible and can be moved by truck to offshore locations during the winter months. Furthermore, clean, well drained, sorted gravel can be used either as easily compacted granular fill or as fill for sandbags, thus reducing the total volumes involved. Islands constructed solely from dredged materials are more costly to build and much less economical in the quantities of materials disturbed during the dredging operation. For example, in placing about 200,000 cubic yards at the site of Immerk B-48, over half a million yards were actually excavated from the sea floor. Some estimates place this figure at up to 1,000,000 cubic yards. A recent paper of Riley, Imperial Oil Limited, describes the design, planning and unique construction methods employed in artificial construction. This paper was presented at the Seventh Annual Offshore Technology Conference in Houston, Texas, in 1975.

Where onshore sources are used in island construction, as is typically done in winter, a



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In Chief

1 working estimate of 125,000 cubic yards per island may  
2 be used in predicting future requirements. This is based  
3 on estimates for Sarpik P-26. There is no estimate of the  
4 number and location of islands which might be constructed  
5 in the next five, ten or twenty years. The distribution  
6 pattern of such islands, and the possible construction  
7 methods to be employed are also unknown at this time.  
8 Obviously this information is to a large extent dependent  
9 on fuel potential, economics and so on. According to the  
10 scenario described recently by Mr. Shearer, up to 100  
11 wells may be drilled in shallow offshore areas. This  
12 would place the potential demand for gravel and sand at  
13 over 12,000,000 cubic yards.

14 I have been talking of the largely  
15 unknown demand picture for those artificial islands used  
16 for exploration purposes. The development phase offshore  
17 presents a somewhat different picture, and again little  
18 can be predicted, since the construction mode, location  
19 and number of production islands is not known. In the  
20 Adgo field, Imperial Oil anticipates that four permanent  
21 islands may be required for development purposes and that  
22 future discoveries in water depths of over 40 feet may  
23 also be developed on artificial islands.

24 These more or less permanent  
25 islands will have to be better protected than those  
26 used in the exploration phase, and at the moment it is  
27 foreseen that riprap weights for the Adgo development  
28 islands will range from 50 to 3,000 pounds. As islands  
29 are built in deeper water, blocks of quarry stone up to  
30 2.5 tons in weight will be required, with the largest





Staging areas: Staging areas,

It may be appropriate to note



Drilling pads: Drilling pads do not generally account for significant quantities of granular material with typically 10,000 cubic yards being used on a drill site during summer operations.

In the long term, however, such operations can account for significant quantities. There is again some difficulty in estimating future requirements. It is a requirement under the Territorial Land Use Regulations that drilling sumps be backfilled, using excavated material to the original ground surface level. However, where sumps are dug in ice rich terrain, there may not be sufficient material to fill them. Thermokarst activity in ice rich materials may also create the need for additional fill. As a consequence, quantities of gravel in excess of 20,000 yards have been used to restore a sump, and so satisfy the intent of the regulations. Extrapolating from the demands of previous drilling operations, it is evident that a considerable quantity of fill will be required in the next ten or twenty years for drilling pads.

#### Road construction and maintenance:

At present road construction and maintenance is confined to the Dempster Highway and to roads in and around Inuvik. The major remaining work on the Mackenzie/Dempster Highway consists of gravelling the surface. Approximately 120,000 cubic yards of crushed rock or gravel will be required for the Inuvik-Arctic Red section, and 140,000 cubic yards from Arctic Red River to the Yukon Border.

A high priority has been accorded to the Inuvik-Tuktoyaktuk highway and construction could



get underway within the next five years. Estimates of material requirements vary widely, with from four to ten million cubic yards of fill being suggested. A figure of 5,000,000 cubic yards, however seems realistic. The quality of material that might be used varies widely, from broken shale to till and from sand to gravel according to the supply. The shale is being used for construction of the Dempster Highway west of Fort Macpherson and up to 69,000 cubic yards per mile are being used. Maintenance requirements on northern highways will vary according to the quality of the original fill materials such as texture, moisture content and so on, but may be estimated at ten percent per year, that is to say that the road is effectively reconstructed every ten years.

Townsite development: Community requirements for granular requirements have increased dramatically in recent years and among the delta communities Inuvik and Tuktoyaktuk are outstanding in this respect.

According to the Government of the Northwest Territories, Inuvik will require 3,000,000 cubic yards. The report, prepared by Makale, Holloway and Associates for the Government of the N.W.T. indicates that industrial developments may require as much as three or four million cubic yards, for a total estimated demand of 7,000,000 cubic yards. These requirements are for shale and/or crushed rock.

Similarly, in Tuktoyaktuk, townsite demands developed in 1975 for the period of 1976-1982 are estimated at 460,000 cubic yards. However, recent





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Government of the Northwest Territories figures indicate that 1,000,000 cubic yards may be required, and that when industrial development is taken into account, this figure could reach 3,000,000 cubic yards.

The Aklavik Development Plan indicates that about 35,000 cubic yards will be required for road upgrading over the next seven years, and that at least 70,000 cubic yards will be required for further townsite expansion.

Up-to-date figures were not obtained for Fort Macpherson and Arctic Red River but estimates of 600,000 and 220,000 cubic yards respectively were cited in the Mackenzie Valley Granular Material Inventory.

Oil pipelines: I have no estimates of material demand for an oil pipeline in the delta area, although some figures are given in the Mackenzie Valley Granular Material Survey based on information received from Mackenzie Valley Pipeline Research Ltd, in 1972.

Finally Railroads: While a railroad is not under active consideration for the Mackenzie Valley and delta area, the enormous quantities of fill, subballast and ballast should be kept in mind in assessing the impact of future developments on the supply and construction material in the Mackenzie Delta. A double track system would require from 500 to 575 million cubic yards of fill and ballast. In the delta area, considerable quantities of rock would be required to meet ballast specifications.

It is clear from this brief review



1 that our understanding of the present and potential de-  
2 mand for rock and gravel in the delta area is far from  
3 complete and in terms of major development projects, it  
4 will only improve as final design information becomes  
5 available from industry.

6 Supply: A comprehensive granular  
7 material inventory was initiated in 1972 by the Department  
8 of Indian Affairs and Northern Development, to determine  
9 the availability, quantity and quality of construction  
10 materials in the river valley and delta. The program was  
11 undertaken in the knowledge that within a few years,  
12 several major construction projects would be underway in  
13 the area, and that the Department had the responsibility  
14 under the Territorial Lands Act , to manage granular  
15 resources.

16 The aims of the program were;  
17 to,

18 " (a) The determination of the granular material  
19 requirements by location, quantity and quality, of  
20 all foreseeable major developments proposed for the  
21 Mackenzie Valley, for community development and for  
22 exploration and development purposes in the Delta  
23 and Tuk Peninsula.

24 (b) The determination by location , quantity and  
25 quality of useable deposits of granular materials in  
26 the Mackenzie Valley, Delta and Tuk Peninsula.

27 (c) To designate and reserve certain granular mater-  
28 ial sources for public purposes. These reserved de-  
29 posits will be used for community development purposes,  
30 for roads, airstrips and other public facilities."



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1 and finally

2 "(d) The development of policy regulations and ad-  
3 ministrative structure to conserve and control the  
4 utilization of granular resources."

5 The inventory was carried out  
6 by three consultants, each investigating a major part of  
7 the area. Of particular interest here, is the work car-  
8 ried out by Ripley, Klohn and Leonoff who covered the  
9 Tuktoyaktuk Peninsula, Richards Island and the Mackenzie  
10 Delta south to Fort Macpherson and the Arctic Red River.  
11 The area to the west of the delta and the Yukon Coastal  
12 Plain was not included in the inventory. Four reports  
13 were devoted to descriptions of potential sources of  
14 material in the immediate vicinity of Tuktoyaktuk, Arctic  
15 Red River, Fort McPherson, and Inuvik, while a further  
16 four reports detailed sources in the remainder of the  
17 contract area.

18 It is important to bear in mind  
19 that the inventory was of a general nature and that the  
20 information and the quality and the quantity of materials  
21 presented in the reports is based on very limited field  
22 reconnaissance, hand dug test pits and limited drilling.

23 A total of 132 potential  
24 sources of bedrock and granular material were identified  
25 by the consultants.

26 THE COMMISSIONER: That's  
27 in the delta?

28 A This is in the contract  
29 area that I've just described, the Tuk Peninsula, Richards  
30 Island, modern delta, and in the vicinity of communities.





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1 THE COMMISSIONER: Excluding  
2 the area to the west of the delta, and the Yukon Coastal  
3 Plain?

4 A That's correct, yes.

5 A total of 132 potential sources  
6 of bedrock and granular material were identified by the  
7 consultants, of which 33 were rejected for geotechnical  
8 or environmental reasons. These related to such factors  
9 as high ground ice content or conflicts with proposed  
10 IBP sites and migratory bird sanctuaries. I should point  
11 out that the 33 are sites which were rejected for devel-  
12 opment purposes. They are explained in some detail in the  
13 reports, and would be available for development, I presume,  
14 if consent was given by the various authorities for this.

15 I would like to discuss the supply  
16 available to each community first.

17 To take Fort McPherson and  
18 Arctic Red, both communities are served by good granular  
19 material supplies with an additional 2.5. million cubic  
20 yards available from a newly developed pit near Frog  
21 Creek near the Dempster Highway. This is referred to  
22 as source 650. While the deposit is being used as a source  
23 of gravel for the highway, it is being managed by the  
24 Department of Indian Affairs and Northern Development to  
25 ensure a continuing supply to these two communities.

26 Aklavik: Granular material for  
27 Aklavik is currently obtained from the Willow River,  
28 about ten miles from the settlement. Some material has  
29 also been obtained from the Caribou Hills. While the pot-  
30 ential supply at Willow River estimated at over 500,000



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1 cubic yards will satisfy long-term demands for the com-  
2 munity , the supply available to any major industrial  
3 development in the area, from this source, will be limited

4 While these three communities  
5 enjoy a reasonably accessible supply of good gravel,  
6 Inuvik and Tuktoyaktuk face serious shortages of suitable  
7 rock and gravel in meeting long-term demands

8 According to the proposal by  
9 the Canadian Wildlife Service to establish the Campbell  
10 Lake Hills as a national wildlife area -- I'm sorry I  
11 seem to have skipped a page here.

12 THE COMMISSIONER: Miss  
13 Hutchison, you might just give Mr. Inglis your copy.  
14 We're at page 16 if that's the page missing from your--

15 A Thank you.

16 There are virtually no remaining  
17 sources of sand or gravel in the vicinity of Inuvik. There  
18 are, however, a number of rock quarries in operation, the  
19 principal ones being the Department of Transport pit at  
20 the airport, and two pits used during highway construction  
21 Other locations have been identified where shale and  
22 dolomite can be obtained by pit development.

23 If the three readily accessible  
24 sources of bedrock listed by the consultant, and these  
25 are referred to as I-402, 403, and 404 respectively, were  
26 to be fully exploited, approximately 8,600,00 cubic yards  
27 of fill and aggregate would be available, an amount which  
28 does not greatly exceed the projected demands of the  
29 community alone.

30 These three sites, together with



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two recently proposed by D.P.W. in the Mackenzie Highway-  
Campbell Lake area and Imperial Oil, the Gull Creek-  
Rocky Hills area, are located on the periphery of the  
proposed Dolomite Lake- Campbell Lake Ecological Site,  
and Campbell Lake Hills National Wildlife Area. Both of  
these proposals have the Mackenzie Highway and East Channel  
of the Mackenzie River as two of the major site boundar-  
ies.

According to the proposal by  
the Canadian Wildlife Service to establish the Campbell  
Lake Hills as a National Wildlife Area, the quarry sites  
proposed by the Department of Public Works, and Imperial  
Oil and the consultants pose a threat to the survival of  
a population of rare and endangered peregrine falcons, as  
well as to the existence of rare plant assemblages and the  
natural beauty of the area.

Quarry operations involve such  
intrinsically noisy activities as blasting, crushing,  
screening, stockpiling and hauling of rock and gravel.  
They may also be very dusty operations. The case for ex-  
cluding quarrying operations from the area is put suc-  
cinctly in the following quote, taken from a section of  
the Canadian Wildlife Service proposal dealing with the  
effects of human impact; and I quote:

" Quarrying and recreational activities have al-  
ready resulted in territory and nest abandonment  
by one pair of peregrine falcons, reduced the æsthe-  
tics of the area, and almost obliterated a rare  
plant assemblage. Litter buildup and tree destruct-  
ion are becoming widespread. Campfires and inadequate





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1 screening on wood-burning stoves pose the additional  
2 threat of forest fire. Proposed quarrying activities  
3 and developments which would increase accessibility  
4 threaten further disruptions of the falcon population  
5 and rare plant assemblages. The aesthetics of the  
6 area, known historic and possible prehistoric arch-  
7 aeological sites, and important staging areas for  
8 migrating whistling swans are also in jeopardy.  
9 Unless measures are taken to control or redirect  
10 the type, location and chronology of future use, any  
11 increase in accessibility will probably result in  
12 irreparable damage to an <sup>area</sup> unique in North America  
13 for its faunal and floristic elements."

14 Much can be done to mitigate the  
15 impact of quarrying operations on the falcons, by restrict-  
16 ing most of the work to the winter months. However, this  
17 may impose severe restrictions on material supply to  
18 critically timed construction programs, and inevit-  
19 ably some summer operations such as barge loading or  
20 truck hauling would be carried out if these quarries were  
21 to be fully developed. Further, the Canadian Wildlife  
22 Service consider in their proposal that, and I quote  
23 " Accidental spills of toxic chemicals used in  
24 quarrying supportive activities and shockwaves from  
25 blasting could potentially result in injury to sev-  
26 eral aquatic and semiaquatic species. Inasmuch as  
27 predatory raptors will tend to select live prey  
28 species exhibiting abnormal behavioral patterns-- a  
29 reference is made a literature review in Mueller in  
30 1974-- , the effects of delayed-lethal and nonlethal



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poisoning of prey species could be transmitted to peregrine falcons. Even if blasting activities are confined to winter operations, ground shockwaves and air compressions may cause loose, overhanging rocks to collapse on a few eyries, some of which appear to be traditionally used."

At the present time I understand that an interdepartmental working group on proposed IBP ecological sites is currently considering the proposal for the establishment of the Dolomite Lake - Campbell Lake Ecological Reserve and that no quarrying permits will be issued, including those applied for by Imperial Oil and the Department of Public Works, until the Minister has reached a decision on the status and future management of the area.

However, assuming that quarrying will not be permitted near or within the presently proposed boundaries of the reserve, then the demand for fill and aggregate could be met by one or more of the following measures: Firstly by locating and developing sources of competent bedrock in other areas. Secondly, by locating and developing pits in areas where shale or sandstone occurs close to the surface, and thirdly by trucking and barging unconsolidated material from other parts of the delta.

With respect to the first option a number of companies are actively searching for alternate sources of bedrock in the delta area. Such surveys would be an essential part of the pre-engineering work required for railroad construction and other developments where specific standards of sub-ballast and ballast material



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must be met.

The second option is one which has been actively followed in road construction on the Dempster/Mackenzie Highway, on the Inuvik by-pass road and which has been proposed for the southern half of the Inuvik-Tuktoyaktuk Highway. It is an option followed where extremely large quantities of general fill are required at the minimum of expense. Some of Inuvik's requirements have been met by use of shale but there are certain major problems associated with this type of pit development.

First of all, in lowlying areas a considerable volume of saturated organic material must be stripped from the pit area and piled. Secondly, frequently up to 25 feet of overburden must be removed. In the delta area, this overburden consists of ice rich silty clay soils which commonly contain massive ground ice. For example geotechnical data from a pit recently used on the Dempster Highway indicated that 16 feet of overburden was composed of eight feet of ground ice overlying eight feet of ice rich silty clay. The presence of extensive ground ice masses and supersaturated silty clays on the walls of a pit can be hazardous. There is a potential for serious slumping with accompanying mudflows. Successive retrogressive flow slides may also occur. The ice rich overburden must be stockpiled near the pit while quarrying is in progress. These piles are inherently unstable and slumping is common as thawing progresses in the summer months. Mudflows from such piles can enter streams and waterbodies and spread into undis-





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1     turbed terrain. These problems can be reduced by adopt-  
2     ing low profile waste piles, although much greater areas  
3     are then required. Restoration and revegetation of these  
4     pits is often very difficult and costly. Few plants  
5     establish readily on mounds of sterile, arid soil.

6  
7             In lowlying areas overland  
8     drainage patterns are often disturbed, resulting in the  
9     creation of large shallow ponds which may be impossible  
10    to drain and restore. Surrounding vegetational patterns  
11    are altered. Because tree growth is limited in much of  
12    the region, these pits are difficult to screen from roads,  
13    and the results are aesthetically unpleasing.

14            These are some of the realities  
15    of this type of operation and numerous examples can be  
16    seen around Inuvik and along the highway.

17            The third option is one which  
18    has been implemented by the town of Inuvik and by local  
19    contractors for some time. Gravel has been hauled by  
20    barge and truck from a source on the escarpment of the  
21    Caribou Hills, about 38 miles northwest of Inuvik. The  
22    source, which according to the consultant contains up to  
23    6,000,000 cubic yards of gravel and sand, is located with-  
24    in the core area of the proposed Caribou Hills ecolog-  
25    ical site. As far as I am aware, no new permits for  
26    quarrying in this location will be issued, pending a  
27    decision by the Minister on the status and future manage-  
28    ment of the proposed reserve. The only alternative to  
29    this site referred to as I-407, at the present time, is  
30    the Yaya Lake esker-kame complex, although this location  
   is considerably further from Inuvik.



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1 To turn to Tuktoyaktuk, up to  
2 1,000,000 cubic yards of sand and gravel are required by  
3 the community to meet long term demands. The consultant  
4 identified ten useable sources of material, based on  
5 Geological Survey of Canada surveys, pipeline location  
6 surveys and other previous work, which could yield up to  
7 2,280,000 cubic yards if fully developed. While this  
8 would satisfy community needs, it would fall short of the  
9 industrial demand. However, there are serious problems  
10 involved in using some of these sources. Six of them are  
11 ocean spits or beaches, each estimated to contain less  
12 than 100,000 cubic yards of sand or gravel.

13 Conflicts with fish and wildlife  
14 have been identified and any development would also have  
15 to take into full account the possible impact on coastal  
16 erosional and depositional processes.

17 Of the four remaining sources,  
18 one is a small gravel island which is in current use.  
19 This is referred to as T-106, while the others are esker,  
20 kame, and outwash deposits located up to 17 miles south-  
21 east of the community to which access is difficult.  
22 Gravel could possibly be obtained from actively eroding  
23 offshore islands, such as Garry Island, or from the sea  
24 bottom. A consequence of road construction between Inuvik  
25 and Tuktoyaktuk is that distant, high quality, sources  
26 of material will be brought within reach. Conversely,  
27 the construction of the highway may itself exhaust many  
28 of these supplies

29 I have briefly outlined some of  
30 the factors which must be taken into account in meeting



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1 community demand for sand and gravel. I would like now,  
2 to outline material supply in the other parts of the  
3 delta.

4 As I mentioned in the discussion  
5 of demand, there exists a very large demand for bedrock  
6 as a source of fill and aggregate, but particularly for  
7 massive riprap for use in slope protection on offshore  
8 development islands. I have already mentioned the Camp-  
9 bell Lake site, which is preferred by Imperial Oil. The  
10 only other source of bedrock, of the required quantity  
11 and quality so far identified is located at Mount Sedge-  
12 wick, in the British Mountains, which is in the Yukon  
13 Territory. This site was first identified by D.P.W. in  
14 the course of a survey for possible harbour sites. Their  
15 report is titled Hershall Island feasibility of a marine  
16 terminal. To develop this site a road, harbour, staging  
17 area and airfield complex would be required in what is  
18 known to be an environmentally sensitive area. The pro-  
19 posal put forward by Imperial Oil as an alternative --  
20 this proposal was put forward by Imperial Oil as an  
21 alternative to exploiting the Campbell Hills site, and  
22 also involves the construction of a concrete block man-  
23 ufacturing plant.

24 This proposal, which I understand  
25 is not under active consideration by Imperial Oil at this  
26 time, poses some very major environmental problems. First,  
27 rock would be quarried immediately adjacent to the channel  
28 of the Trail River with the attendant possibility of dis-  
29 turbance to the channel and fish resources. (2) The  
30 movement of an undetermined quantity of massive rock some





30 miles across the Yukon Coastal Plain will require the establishment of a permanent road network, since much of the terrain is underlain by extensive ground ice and is thus sensitive to disturbance. (3) The area forms part of the range of the Porcupine caribou herd and critical calving grounds may be affected by quarrying and road construction activities. The area is also used extensively by migratory birds and other wildlife populations.

(4) Road construction or extraction of sand and gravel from the Babbage River may result in siltation and sedimentation with a serious impact on the fish resources of the region. (5) The dredging of a gravel bar at the harbour site may affect coastal erosion and deposition processes. (6) The creation of an extensive staging area and concrete block manufacturing plant would create a heavy demand for granular materials in the Yukon Coastal Plain area.

Now, given the assumptions that, (a) alternative bedrock sources are not available in the delta or on the Beaufort Sea coast and (b) that there are no workable technological alternatives to the use of artificial islands protected with massive rock riprap which are acceptable to industry and government, then the advantages and disadvantages of developing the known sources in the Campbell Hills area, as opposed to those of developing Mount Sedgewick, would have to be closely examined. It is essential therefore, that these assumptions are supported or rejected on the basis of a thorough geotechnical engineering and environmental evaluation, before a comprehensive resource management plan is form-



ulated.

Since most of the major exploration and development activities are centered on the Richards Island and Parsons Lake area, it follows that the heaviest demand for sand and gravel will be from nearby sources.

In the Richards Island-Caribou Hills area, the consultant has evaluated a large number of potential sources, which together have been estimated to contain 80 million cubic yards of sand and gravel. However, many of the sources on Richards Island contain fine grained material in amounts of less than half a million cubic yards. Most of the better material is concentrated in six deposits, three of which make up the currently exploited Yava Lake source. Of the three remaining sources, only one has significant potential, source 222 at Swimming Point, which is estimated to contain 10 million cubic yards.

In the Caribou Hills area, adjacent to the East Channel of the Mackenzie River, the consultant has evaluated ten sources, each containing over half a million cubic yards. Eight of these are located within the proposed Caribou Hills IRT site. If these sources are not available for development this would leave only two deposits located near Tununuk and Lucas Point respectively for development, yielding a possible 7 1/2 million cubic yards.

Now, what I wish to demonstrate in citing these data, is that, excluding the Ya-Ya Lake deposit and those deposits located within the proposed



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IBP reserves, that less than an additional estimated  
18 million cubic yards of sand and gravel are readily  
available in the Richards Island- Caribou Hills area,  
to meet the demand for high quality construction material  
In this area this includes the cross-delta pipeline, gas  
gathering systems at Taglu and Niglintgak, artificial  
islands, drilling and staging areas, and the communities.





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I have specifically excluded small sources, that is those containing less than half a million cubic yards, from this discussion of supply since many of these sites contain quite variable material, are underlain by massive ground ice and they are accessible only during winter. While these difficulties are associated with many of the larger sites, the quantity and quality of material available may well justify the impact of road construction, barge landing sites, airstrips, camps, stockpiles, processing equipment and so on - the infrastructure which goes hand in hand with such activity. Undoubtedly, small deposits would be developed in response to local project demands. For example, it may be expedient to open a small quarry near a remote facility where only limited quantities of material are required.

One of the major difficulties involved in estimating supply is that little is known of the quantity and quality of material in each deposit, and whether the material can be readily extracted. To remedy this situation, industry has undertaken a considerable amount of geo-technical work in the Delta, and in particular the Yaya Lake deposit has been thoroughly investigated.

In addition, DIAND has recently concluded the geotechnical evaluation of three sources of granular material which are estimated to contain up to 36 million cubic yards. One of these sites, I refer to is source 326, is one of the largest in the delta, and is located within the buffer zone of the IBP reserve. Work on the site was carried out in consultation



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with the international biological program.

I personally feel that if this site is eventually developed, it can be done in such a way that the natural features and aesthetic appearance of the area are not affected.

The principal objective of the DIAND drilling program was to obtain detailed information on the three largest sources of material in the area. This information, supplemented with that supplied by industry, will form the basis for a management plan. In the long term, however, the total amount of material available from these sources, and the Yaya esker-kame complex, will be insufficient to meet the demands. Other sources and alternative technological approaches will almost certainly have to be considered.

The situation in the Parsons Lake area is somewhat different. There, the Inuvik-Tuktoyaktuk Highway and the gas pipeline are for the most part remote from other developments and their material requirements may be less rigorous than those of the more regional activities focused on the Richards Island area. There may nevertheless be conflicting demands from the gas producers, communities and highway engineers for material near Parsons Lake. The consultant has identified several large sources of granular material in the area such that, with careful management, these demands could probably be met. Before any development could take place, a considerable amount of geotechnical information would need to be provided for each of the deposits, together with an environmental impact assessment. The needs of the various users would also



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have to be much better defined.

THE COMMISSIONER: Thank you very much, Mr. Inglis. It's certainly very helpful, and bears on the terms and conditions we are seeking to develop in relation to the pipeline. Well, I think we should adjourn for coffee.

(PROCEEDINGS ADJOURNED AT 11:30 A.M.)

(PROCEEDINGS RESUMED AT 11:50 A.M.)

MR. GOUDGE: Sir, before we begin<sup>the</sup> cross-examination, perhaps I could advise of two reports on one other matter that<sup>the</sup> participants I think ought to know. We have two reports that are available that have recently come into our possession. The first is called "Impressions On The Construction Of The Pointed Mountain Gas Pipeline," by Messers Land, Dean and Brant; and the second is "Northern Yukon Fisheries Study - 1971 to 1974", Volume 2, compiled by Messers Steigenberger Elsen, Bruce and Yole. That's the second volume; the volume we announced some time ago.

I guess I should say that the first report that I mentioned is a fisheries oriented report, concerning the Pointed Mountain Gas Pipeline. Those reports, as I say, are available for inspection.

The second thing I wish to say, sir, is that we have another report which has been prepared by M.P.S. Associates of Winnipeg, and which will be available for inspection in our offices in Yellowknife by Friday, February 26th at the latest. That report is entitled, "Effects Of Changing The Duration Of Pipeline Construction On Selected Variables". The





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1 report is dated February, 1976.

2 MR. MARSHALL: I wonder if Mr.  
3 Goudge could arrange for a copy of the last report to  
4 be sent to Arctic Gas. I'm sure Foothills would be  
5 interested in that as well.

6 MR. GOUDGE: I think, sir, we  
7 have limited copies. I'll do my best to send copies to  
8 each of the participants, but I don't know frankly at  
9 this stage how many copies we will have in our office  
10 in Yellowknife, as of the end of next week, but I'll  
11 do my best.

12 MR. MARSHALL: That's not good  
13 enough in my judgement, sir. We've bent over backwards  
14 to get reports for the Commission counsel, and their  
15 many advisors and participants; and this is a very  
16 fundamental study that --

17 MR. GOUDGE: I'll bend over  
18 backwards.

19 MR. MARSHALL: -- you, <sup>sir,</sup> asked be  
20 done. It's got important ramifications for the entire  
21 hearing, and surely we're entitled to get a copy of such  
22 an important report. We're prepared to pay the additional  
23 cost of printing one more copy if that's what's required.

24 MR. GOUDGE: I'm sure we'll  
25 have enough to distribute, sir; I assume we will.

26 MR. MARSHALL: Sir, while I've  
27 got the mike perhaps I could raise one other matter.  
28 Mr. Bayly indicated that he had completed his evidence  
29 pertaining to the delta with two possible exceptions.  
30 One pertaining to the panel that he wished to call



1     pertaining to community information programs; and the  
2     other relating to evidence to be presented by one  
3     Mr. C.W. Nicol. Mr. Bayly provided us with copies  
4     of an article, or brochure, by Environment Canada,  
5     authored by C.W. Nicol, and indicated that while this  
6     would not be the evidence, this would form really the  
7     basis of the evidence, where it would deal with this  
8     subject. The subject of this brochure is the "Misushima  
9     Oil Spill," relating to a spill that occurred in December  
10    18, 1974 at the Misushima refinery in the inland Sea  
11    of Japan..

12                     The brochure that we've been  
13               with  
14    provided/contains the observations that were made by  
15    Mr. Nicol , who visited the site. He was apparently in  
16    Japan studying the martial arts and fisheries in Japan,  
17    and compiled this report.

18                     MR. BAYLY: Mr. Commissioner,  
19    before we go any further, that is not the evidence of  
20    this witness, and I provided that so counsel would have  
21    an idea that we would be leading some evidence that  
22    had to do with an oil spill that took place in the  
23    inland Sea of Japan; when that evidence has been  
24    provided, Mr. Marshall can bring any motion he likes  
25    about it's relevance --

26                     THE COMMISSIONER: When the  
27    summary has been provided.

28                     MR. BAYLY: -- when the summary  
29    has been provided, but I think this is premature, and  
30    if he'd going to pick holes in a brochure and the  
31    witnesses being in Japan for various reasons, I think



Inglis, Stephen  
In Chief

1 that that is unnecessary.

2 MR. MARSHALL: Sir, perhaps if  
3 I could just include the remarks, and then Mr. Bayly  
4 can decide whether or not he wishes to object. I thought  
5 as a matter of courtesy to Mr. Bayly, that I ought to  
6 let him know before he made arrangements to bring someone  
7 from Japan, that if it was the intention of Mr. Bayly  
8 to lead evidence on the Misushima oilspill, I would be  
9 taking the position that that really wouldn't be of any  
10 assistance to the Inquiry, and that having seen nothing  
11 more than this brochure, which I understand is related  
12 in some way to the evidence that would be given; I formed  
13 the view that I would likely object to that, and that  
14 I thought might help Mr. Bayly to know that in advance  
15 before he went to great expense to arrange for the  
16 appearance of this witness.

17 MR. BAYLY: Well, I'm grateful  
18 to Mr. Marshall for that, Mr. Commissioner, but this  
19 witness will be in Canada at the end of this month.  
20 That's the only reason that he hasn't been prepared so  
21 far, so we'll prepare the summary and let Mr. Marshall  
22 object if he wants to.

23 MR. MARSHALL: Now, is this  
24 evidence going to be about this oilspill? There shouldn't  
25 be any need to be secretive about that.

26 MR. BAYLY: No, it's not a  
27 secret, Mr. Commissioner. The evidence will be about  
28 the clean-up techniques employed in this oilspill and  
29 reference has already been made to the techniques used  
30 as being ones that would have to be used for any oilspill





1 in the Beaufort Sea or the Mackenzie Delta.

2 MR. GIBBS: Sir, I certainly  
3 will join with Mr. Marshall because of it's total  
4 irrelevance/<sup>to</sup> the construction of a natural gas pipeline,  
5 and it seems to be even a waste of time to prepare the  
6 evidence, because there's no relationship at all to this  
7 Inquiry.

8 THE COMMISSIONER: Well, we've  
9 been through that. Mr. Marshall and Mr. Hollingworth  
10 raised it and in fact Mr. Hollingworth acknowledged  
11 that the evidence that has been heard here in Inuvik  
12 in January and February was evidence that was appropriat  
13 to hear. In any event, I've dealt with that, and I  
14 don't propose to deal with it again now. When the  
15 summary's been distributed, if counsel want to deal  
16 with its relevance, certainly I think we should  
17 consider their objections at that time, but I don't  
18 think that we should now, as a matter of courtesy. Mr.  
19 Bayly distributed this pamphlet and it seems to me  
20 we should wait for the summary to decide what position  
21 all of us ought to take.

22 That -- I should add, Mr. Gibbs  
23 that I think Mr. Marshall throughout <sup>objected</sup> to certainly  
24 some of the evidence we were hearing here. Mr.  
25 Hollingworth objected to some evidence, and so did I,  
26 but neither his nor my objections prevailed, so --  
27 there's one other thing I thought I'd mention. I found  
28 recently that when evidence is heard here, people send  
29 me letters and telegrams objecting -- not objecting to  
30 it but refuting it. Now we're not bound by the rules



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1 of evidence and my practice has been simply to turn  
2 those letters and telegrams over to Miss Hutchinson so  
3 they can be marked as exhibits and distributed to the  
4 participants; and I think of two instances. One is  
5 that we held a hearing at Fort Liard last summer, and  
6 a great many native people said things about Amoco's  
7 employment program on the gas plant at Pointed  
8 Mountain; and I received a long letter from Amoco, saying  
9 that these people had misrepresented the situation, and  
10 my recollection is that I turned that over to Miss  
11 Hutchinson and had it distributed among the parties, I  
12 hope I did. I hope it's not sitting in some file in  
13 my office in Yellowknife.

14 The other instance that occurs  
15 to me is when the four people from Coppermine gave  
16 evidence here about the Gulf employment program last  
17 month, that resulted in a telegram from, I think it  
18 was the settlement council at Coppermine, saying that  
19 those people had no authority to speak for the Village  
20 Council, and it also -- there was also a telegram of  
21 some length from Mr. Arvaluk, the President of the  
22 Inuit Tapirisat of Canada, on the same subject. If  
23 you haven't had copies of those, you might bring them  
24 to Miss Hutchinson's attention, and if she hasn't got  
25 copies she can bring it to my attention; and I think  
26 there have been other things like those coming in, and  
27 that's the way I've been dealing with them; and I don't  
28 really know what else I could do. I can't very well  
29 refuse to read them, I can't read them and then decline  
30 to let the rest of you see them, so I've just had them



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marked as exhibits, and that's what I'll continue to do, unless somebody objects to it. Okay, we're ready for cross-examination then.

CROSS-EXAMINATION BY MR. GIBBS:

Q Mr. Speller, you now work for the Environmental Assessment Section of the Department of Indian and Northern Affairs?

WITNESS SPELLER: Yes.

Q What are your duties in that section?

A I am a member of a multi-discipline team, involving fisheries biologists, myself I represent wildlife interests, interests in vegetation, interests in <sup>surficial</sup> geology, interests in iceology. Our function is to evaluate and <sup>assess</sup> developments that are taking place in the north, throughout the Northwest and Yukon Territories. These -- my response may come as a result of requests from people in Yellowknife <sup>or</sup> Whitehorse; or they may come directly from the management branches of our section in Ottawa. In other words, the Water, Lands, Forests, and Environment Branch.

Q And you live in Ottawa?

A I do.

Q When I went through your material, I concluded that you had three concerns. One was aircraft, and the second one was workmen, and the third one was tourists. Have I summarised that?

A I think the -- my three major concerns were aircraft activities, second was the





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1 threat of an oilspill or an oil blowout, and third and  
2 finally was the expansion and redistribution of human  
3 population, including tourism, in the delta region, and  
4 their effects of wildlife.

5 Q And you're familiar, I  
6 think you said, with all of the existing projected  
7 developments in the north, the Mackenzie Valley pipeline,  
8 the gas developments systems, the drilling activity, the  
9 Dempster Highway, and the proposed Inuvik-Tuktoyaktuk  
10 Highway.

11 A Yes.

12 Q And you made plain your  
13 concern about aircraft activities in connection with  
14 all of those developments.

15 A That's correct. The  
16 accumulative effect of all those developments.

17 Q Have you made any forecasts  
18 of aircraft activity in connection with those developments?

19 A No, sir, not particularly.  
20 I'm looking at the summary of each and every one. I  
21 look at the number of aircraft involved today with  
22 exploration, operations -- individual exploration  
23 operations that take place in the delta; and I am  
24 trying to extrapolate in my mind the types of problems  
25 that will take place when you have much larger  
26 developments, when you have contractors, and  
27 subcontractors, and company representatives that are  
28 operating all at the same time in the delta, especially  
29 during this construction period.

30 I also take the experience



1 that has occurred in Alaska, where to my knowledge we  
2 have seen quite a proliferation in both in the amount  
3 of aircraft that are operating, and in the activities,  
4 in the areas where those aircraft are operating.

5 Q Yes sir, but to say a  
6 "bunch of aircraft" isn't really very much help, and <sup>as</sup> you're  
7 familiar with all of these projects, have you made  
8 any forecast of the sizes of aircraft and types that are  
9 going to be used on each project in each year?

10 A No, not detailed as to  
11 each type of aircraft involved with each operation.

12 Q Have you made any forecast  
13 or taken the material you have and made any additions  
14 to determine the frequency of flights in respect of  
15 each project in each year or month of construction?

16 A There are some information  
17 concerning the amount of -- the number of aircraft  
18 flights that are predicted for the Arctic Gas Pipeline.  
19 Certainly there has not been information provided by  
20 any of the other developments concerning the number of  
21 flights, or the number of aircraft that would be  
22 associated with each.

23 Q Have you made any attempt  
24 to ascertain those details with respect to the other  
25 activities?

26 A I have only attempted to  
27 ascertain that, as I say, in my own judgement of what  
28 is taking place now, and to the best of my knowledge,  
29 trying to ascertain what might happen in the future  
30 as we get on the road of development in the north.



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1 Q Have you made any forecast  
2 of the times of the year when these developments are  
3 occurring when there will be the highest aircraft use  
4 in numbers of aircraft?

5 A From what I can see of the--  
6 from my assessment of the developments that have taken  
7 place so far, <sup>that</sup> or/ are projected for the north, I see a  
8 massive increase in the amount of aircraft, or I predict  
9 in my own view, a large increase in the amount of aircraft  
10 that will be taking place during summer.

11 As you're aware, many of the  
12 seismic operations, many of the oil exploration operations  
13 taking place in the delta occur in winter. During  
14 winter, the numbers--there are no migratory birds in the  
15 delta. We are faced with the proposals to construct  
16 three gas plants; we are faced with the proposal to  
17 undertake pipelining operations in the delta during the  
18 summer. This will obviously increase the number of  
19 aircraft, in my opinion.

20 Q But how many, Mr. Speller?  
21 You know two is a massive increase over one, and if  
22 you're going to determine, surely, the effect on wildlife,  
23 you should, from what you know of these developments,  
24 be able to make a pretty good estimate of how many  
25 aircraft are going to be flying to Shingle Point in  
26 September of 1980.

27 A Well, unfortunately, sir,  
28 with regards to the gas development plants, and to the  
29 cross-delta alternatives, or sorry, the cross-delta  
30 construction, the number of aircraft and the number of





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1 trips has not been identified. Again I say, I am -- I  
2 suspect they're going to increase quite significantly.

3 Q Then Mr. Speller, is this  
4 the case, that you're concerned about significant increases,  
5 but you can't offer any forecast as to the sizes of  
6 aircraft which will be increasing in number in the north;  
7 whether they're turbo or jet or propellor or helicopter;  
8 the times of the year when the greatest use will occur;  
9 or the frequency of flights from any particular point to  
10 any other particular point?

11 A I can say that that  
12 information is not available, consequently I do not know  
13 those particulars.

14 Q The best you can do on  
15 aircraft is what anyone who has been to this Inquiry  
16 can do, is say there are going to be a lot of aircraft  
17 flying around while these developments are going on?

18 A That's correct.

19 Q And do you have any evidence,  
20 sir, that whatever this number of aircraft and flights  
21 are going to be, that the effect of that activity will  
22 reduce the wildlife population?

23 A I have the concern that  
24 with the number -- with an increase in the number of  
25 aircraft that will take place, it will involve a number,  
26 a large number of pilots that are inexperienced in the  
27 north, flying in weather conditions that are often less  
28 that optimal. There is the concern that the birds,  
29 especially waterfowl, especially during nesting and  
30 brood-rearing periods, that these birds will be subjected to an



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1 increased amount of disturbance from aircraft.

2 Q Yes sir, and have you any  
3 evidence that the aircraft activities, the number and  
4 height of which you don't know, will reduce the wildlife  
5 population?

6 A We know the following --  
7 we are -- the following information is. I believe, true  
8 with regards to waterfowl: that is, if waterfowl are  
9 harassed, at an increasing frequency, in other words,  
10 birds are forced to leave their nests, or are frightened,  
11 sorry, then there is a possibility, a very good possibility,  
12 that aerial predators, such as jaegers, and gulls, will  
13 have increasing opportunity to raid the nests of those  
14 birds. Also, there is the potential that the energy  
15 reserves of the birds would be used up during their  
16 flight responses, and as such, one might see  
17 an increase in the amount of nest abandonment.

18 Q Yes sir, but those are  
19 really only apprehensions. You have --

20 A That's correct.

21 Q -- you have nothing to  
22 show this Inquiry to demonstrate that your apprehensions  
23 will occur, and that aircraft activity will reduce any  
24 of the wildlife population.

25 A I am basing my concerns  
26 on the concerns and information provided to me by  
27 individuals such as Dr. Tom Barry, another research  
28 scientist who has spent long periods in the Arctic, as  
29 well as other biologists who have observed that when  
30 migratory birds are frightened from their nests by



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1 aircraft, that these birds are susceptible to a higher degree  
2 of -- the eggs of these birds are susceptible to a  
3 higher degree of predation.

4 Q Well sir, in your day to  
5 day activities, have you seen any reports providing any  
6 evidence by way of percentages or numbers in reduction  
7 of wildlife population because of aircraft activity?

8 A No sir, I am not familiar  
9 with any particular report.

10 Q And have you seen any  
11 reports, either by way of numbers or percentages,  
12 to the effect that aircraft activity will induce wildlife  
13 species to change their habitat?

14 A Wildlife species?

15 Q Yes.

16 A To change their habitat?

17 Q Yes.

18 A Certainly there are reports  
19 indicating local shifts, but as for changes in habitat,  
20 no, I cannot tell.

21 Q All right. Now sir, your  
22 second concern had to do with oil spills.

23 A Yes.

24 Q And you don't relate that  
25 in any way to pipeline -- to the natural gas pipeline  
26 construction do you?

27 A I do, sir, in relation to  
28 the fact that large quantities of fuel will be required  
29 for the operation of construction equipment, etc., and  
30 that there is the risk of a fuel spill, a large fuel





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1 spill, in areas such as Shallow Bay.

2 Q And are you able to  
3 quantify that risk?

4 A No sir, I am not.

5 Q Have you made comparisons  
6 with any other pipeline construction activities to  
7 determine the likelihood of spills of those toxic  
8 materials?

9 A The only pipeline operations  
10 of which I would wish to use as<sup>a</sup> comparison would be the  
11 Alyeska Pipeline, and I do not have such facts at my  
12 disposal.

13 Q So again, like the aircraft,  
14 that's sort of personal apprehension of something that  
15 might happen?

16 A That's correct, sir.  
17 The threat exists.

18 Q Oh yes, sir, and the  
19 threat exists by three tanks, I'm told, that are outside  
20 of town here, that haven't burst yet. Just because  
21 something's there it's a threat, isn't it?

22 A That's correct.

23 Q But that is of no  
24 assistance in determining the likelihood of it causing  
25 damage.

26 A That's correct.

27 Q Now sir, you expressed  
28 concern about the workmen, and the effect they're going  
29 to have on your wildlife. Have you been on any of  
30 the Arctic drillsites, during the course of drilling



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1 activity?

2 A Yes sir.

3 Q And have you seen any of  
4 those workmen going out in this Arctic weather to do  
5 hunting or fishing?

6 A You're right, sir. As I  
7 indicated in my report, inclement weather conditions,  
8 and frankly the lack of large numbers of waterfowl  
9 which usually attract people, the lack of visible  
10 vegetation, and also the fact that these workmen are  
11 working oftentimes very long shifts, that they do not  
12 demonstrate any great concern with their surroundings,  
13 and this has also been seen in Alaska, I believe.

14 Q Then can't you extrapolate  
15 that to the workmen/<sup>who</sup>are going to be constructing the  
16 natural gas pipeline in the winter conditions and  
17 conclude that they're not going to have much of a  
18 menacing effect?

19 A As far as <sup>the</sup>construction  
20 operations in the wintertime, and the movements of  
21 workmen in winter, I would agree. However, we are  
22 faced with the pipelining operations that are going to  
23 take place during summer in the delta.

24 Q Well that's those bad  
25 guys, Arctic Gas, but the winter operations you're not  
26 concerned with at all?

27 A Certainly, the amount  
28 of disturbance would be significantly less in the delta  
29 regions during winter operations.

30 Q Then sir, you express some



## Cross-Exam by Gibbs

1 concern at the increase in population in Inuvik, by  
2 reason of the operations personnel, which would be  
3 located here for pipeline operations?

4 A That's correct.

5 Q Have you calculated the  
6 numbers of people who will be resident in Inuvik, when  
7 the pipeline is in operation?

8 A Are you referring  
9 specifically here to those -- just to those individuals  
10 that are associated with the pipeline company per se,  
11 or are you speaking of all the suppliers that are involved  
12 with the pipeline in support of it?

13 Q Well, let's start with  
14 the pipeline. How many permanent residents are these  
15 pipelines going to have, either Foothills or Arctic  
16 Gas.

17 A That information -- there  
18 is no specific information to my knowledge on that.

19 Q What suppliers are you  
20 going to see located in Inuvik, to assist or to supply  
21 during operations and maintenance of the pipeline?

22 A Well, certainly I think  
23 one could expect that there would be an increased  
24 number of residents associated with fuel supplies for  
25 pipelines, catering operations, trucking and supply  
26 transport operations, aircraft operations.

27 Q You understand that I  
28 restricted it to operations and maintenance, not  
29 construction?

30 A Yes, even -- well, even





Inglis, Speller  
Cross-Exam by Gibbs

1 during the operation of the pipeline, as I -- I believe  
4 that certain numbers of suppliers will be required for  
3 the operation of that pipeline, or will be associated  
4 with it.

5 Q And from what source do  
6 you get that belief, Mr. Speller?

7 A I think that we're looking  
8 at not only the -- I'm thinking in areas such as in  
9 Alberta, where one has seen over the past twenty or  
10 thirty years <sup>very</sup> a/ large expansion in petroleum  
11 exploration, petroleum development; and in association  
12 with that we have seen large expansions in companies  
13 that are associated with these sort of operations. One  
14 in particular sticks in my mind, and this is the people  
15 or suppliers of drilling muds, for instance. Now that  
16 is a supplier or a supply business that is associated  
17 with petroleum exploration and operation.

18 I see another one are companies  
19 that are involved particularly with the control of  
20 wild wells, where these are service companies to larger  
21 companies such as the developers such as Imperial Oil,  
22 or Gulf, or whichever. So I am, in my mind, projecting  
23 that within the construction of any pipeline, and the  
24 operation of any pipeline, that it's not only those  
25 companies that are directly employed by that company,  
26 but it's certainly the additional suppliers as caterers,  
27 as transportation individuals, that will be residing here  
28 in this town.

29 Q Have you any numbers to  
30 put forward, why we have forecast --



Inglis, Speller  
Cross-Exam by Gibbs

1 A No sir. I think it was  
2 evident last night that there is a lack of information on  
3 this topic.

4 Q Then you're concerned with  
5 the activities of tourists and recreation, and people  
6 seeking recreation.

7 A Yes sir.

8 Q What do you advocate in  
9 order to control the effect that these kind of people  
10 will have on the wildlife?

11 A As I indicated in my  
12 testimony, I believe that some more stricter enforcement  
13 is going to be required is one topic; but more important,  
14 I think some additional studies are going to be required  
15 on management aspects of wildlife, with people in this  
16 area. This may involve the establishment of wildlife  
17 areas, the controls of the activities of people in these  
18 areas, the controls of hunting, fishing; where you can  
19 hunt, where you can fish; the number of each species,  
20 or the bag limit, shall we say, of each species that  
21 could be taken.

22 Q Well, that's the same  
23 kind of control that exist in more popular parts of  
24 Canada.

25 A That's correct sir. We --  
26 I think we're looking -- must look towards this problem.

27 Q And that would allay  
28 your alarm about the depredation these people might have  
29 on the wildlife?

30 A Yes sir. I'm expressing



Inglis, Speller  
Cross-Exam by Gibbs

1 a concern that it's time that we look to the future,  
2 and these future problems.

3 Q Have you made any comparison  
4 about the effect on wildlife of tourist and recreational  
5 activities in other parts of Canada?

6 A The estimates, the information  
7 and I am using the judgements that I am making, are  
8 based on the activities of organizations such as the  
9 Canadian Wildlife Service, in the Prairie provinces,  
10 where considerable effort is taken each year to assess  
11 the amount of producing birds, to control bag limits  
12 and to, where possible, buy land in order to encourage  
13 the -- maintain the reproductive level of migratory  
14 birds.

15 Q Yes sir, but have you  
16 taken any area -- for example west of Prince George,  
17 and said, "In an average year into this area there are  
18 10,000 tourists, 1,000 of which are hunters and fishermen,  
19 200 of which exceed the limit." There must be such  
20 statistics available that you could extrapolate. Have  
21 you done anything like that?

22 A No sir I have not undertaken  
23 any particular.

24 Q So again, what you're  
25 expressing to this Inquiry is an apprehension?

26 A That's correct, sir.

27 Q Then, Mr. Speller, can  
28 I sum up your evidence this way, that you are apprehensive  
29 of what might happen by reason of aircraft and people  
30 in the north, but you have no evidence or statistics to





Inglis, Speller  
Cross-Exam by Gibbs

1 put before the Commission to quantify your apprehensions ?

2 A I'd like to qualify that  
3 by providing one statement, in that I think we have --  
4 as you look back in history we can see the development  
5 of North America across the prairie provinces, we can  
6 see what changes have occurred in the distribution of  
7 populations of wildlife. We are fully aware of the  
8 requirements for management that exist today. We are  
9 looking at the development of a new era -- a new area  
10 of North America: the north. I think we share with  
11 our colleagues in Alaska, as well, the concern for the  
12 future protection of wildlife, and its -- and a continued  
13 and a greater management control of wildlife in response  
14 to development of the country.

15 Q Well, I share your concern  
16 too, sir, but I thought you were produced here to present  
17 some <sup>hard</sup> evidence or some comparisons so that some quantifi-  
18 cation could take place, but you're not in a position  
19 to do that.

20 A Obviously, sir, I am here  
21 to try and give an accumulative impact in the delta.  
22 I have attempted to take five different operations -- five  
23 or six different operations here into account. One must  
24 realize that these developments -- these proposals --  
25 some are -- they are all in different stages of proposal;  
26 for instance the Inuvik-Tuktoyaktuk Highway is still in  
27 very preliminary planning stages, where something like  
28 the Mackenzie Delta is very far along the track. I'm  
29 looking ten to fifteen years into <sup>the</sup> future, I'm trying to  
30 take my experience in the north, with those of many others,



Inglis, Speller  
Cross-Exam by Gibbs

1 and to bring to the Commission's attention the types  
2 of concerns that one can see, project.

3 Q All right

4 Mr. Inglis, will you turn to page 3 of  
5 your evidence where you have the Arctic Gas borrow  
6 requirements?

7 MR. GOUDGE: I wonder sir,  
8 if this might be an appropriate place to break for lunch?  
9 It's 12:30 and Mr. Gibbs appears to moving from Dr.  
10 Speller to Mr. Inglis?

11 THE COMMISSIONER: All right.  
12 Maybe you people would -- I gather some of you want to  
13 get the plane tonight, is that on the cards? If it  
14 is I don't mind coming back early. If it isn't, I'd  
15 just as soon not work that hard this afternoon. What's  
16 the picture?

17 MR. GOUDGE: Perhaps we could  
18 just huddle momentarily.

19 THE COMMISSIONER: Go ahead.

20 MR. GOUDGE: I think, sir, it'd  
21 be satisfactory if we came back at 2:00.

22 THE COMMISSIONER: Two o'clock,  
23 all right.

24 (PROCEEDINGS ADJOURNED AT 12:30 P.M.)

25 (PROCEEDINGS RESUMED AT 2:00 P.M.)

26 THE COMMISSIONER: Well, we'll  
27 come to order, ladies and gentlemen. Mr. Gibbs?

28 MR. GIBBS: Mr. Inglis, did you  
29 make any attempt to do your own calculations of Arctic  
30 Gas cross-delta gravel requirements?



Inglis, Speller  
Cross-Exam by Gibbs

WITNESS, INGLIS: 't.  
NO, I didn't.

Q If the Arctic Gas project required to fill the trench where they were doing winter construction on the Alaska supply line, with <sup>borrow</sup> material, do you know how much that would increase their requirements?

A I didn't catch the first part of your question, can you repeat that?

Q Well, maybe I can put it this way. I have here the direct evidence of the officials of the State of Alaska before the Federal Power Commission. In one place, they refer to ditch material, and say that -- talking about 1975, this is a witness called C.H. Hampton, and he says,

"During November 1975, the weather was unseasonably cold, and this caused problems at points along the pipeline. Ditch spoil and water that had accumulated in the ditch bottom became frozen. Previously stockpiled bedding and padding material had to be blasted to loosen it sufficiently to permit loading and hauling to the ditch. Consequently, backfill material went into the ditch in frozen chunks. This prevented proper placement of the pipe, and compaction of the backfill. Therefore certain sections of the line are out of conformity with specifications and will be removed from the ditch and re-installed when weather conditions permit in the spring of 1976."

So that if those are the kind of conditions that prevail





Inglis, Speller  
Cross-Exam by Gibbs

1 in the North Slope, it would appear that Arctic Gas may  
2 have to use bore material for its entire ditch along the  
3 North Slope. Have you made any calculation on the  
4 increase in <sup>borrow</sup> material required for that purpose?

5 A No I haven't.

6 Q Your concern, sir, with the  
7 activities of transportation if <sup>borrow</sup> material has to  
8 come from some distance to be used in industrial  
9 operation?

10 A I'm not necessarily  
11 concerned about it. I pointed out as one of the  
12 realities that are involved in gravel extraction at  
13 the present time, that long haul distances are involved  
14 for some operations, and that undoubtedly this will be  
15 the case in other operations. It may or may not be  
16 their concern, depending on the conditions in which it  
17 is done.

18 Q I thought I detected a  
19 note of disapproval when you spoke of the Imperial Oil -  
20 Shell plan to bring <sup>borrow</sup> material from Sedgewick in the  
21 British Mountains.

22 A If the material were  
23 brought across the Yukon coastal plains, 32 miles during  
24 the winter months on specially constructed sleighs,  
25 using ice roads or snow roads, then the case could be  
26 made that this work would have little environmental  
27 impact, so therefore it may not be a major concern.  
28 From the details of the project that I have, it would  
29 seem to me that sooner or later an all-weather road  
30 would have to be constructed, and that summer operations



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1 would be involved, and that this therefore may well  
2 become a concern. Without the details of the operation  
3 it's very hard to determine whether or not there is  
4 reason for concern. I merely pointed out some of  
5 the factors that would have to be taken into consideration  
6 in reviewing a proposal for this type of development.

7 Q It's your view that if  
8 there were summer movement of large volumes of borrow  
9 materials, some type of permanent road would have to be  
10 constructed.

11 A If materials were to be  
12 hauled from Mount Sedgewick across the coastal plains  
13 in summer months, then a permanent road would have to  
14 be constructed.

15 Q Well, can I read you a  
16 paragraph from Arctic Gas Exhibit 452, called "Consol-  
17 idated Filing, And Third Amendment To Applications",  
18 it's under the yellow tab "Geotechnical", that's at page  
19 28 and this paragraph appears.

20 It's under the yellow tab  
21 "Geotechnical", at page 28. This paragraph:

22 "No granular material exists along the Mackenzie  
23 Delta portion of the Alaska supply lateral  
24 between pipeline miles 319 and 372."

25 That's the last paragraph on the page, and I calculate  
26 that at 53 miles.

27 "Granular<sup>borrow</sup> for the pipeline and ancillary  
28 facilities in this area will have to be hauled  
29 some distance by barge or land, from granular  
30 deposits on the east and west sides of the delta."



Inglis, Speller  
Cross-Exam by Gibbs

1 Do you see that?

2 A I see that, sir.

3 Q And in your review do you  
4 foresee the need for a permanent road to haul that borrow  
5 material from the east and west sides of the delta/ that  
6 53 miles?

7 A Assuming that borrow material  
8 was available for this project on the east and west  
9 sides of the delta, in the winter months probably a  
10 conventional ice and snow roads could be used to haul  
11 material; in the summer months some insulation would  
12 have to be provided for a haul road, if trucks were to  
13 be used on the -- if boundaries were to be used then  
14 if that's part of the proposal then possibly roads  
15 may not be involved.

16 Q You're aware sir that  
17 certainly at least the water portions of the cross-delta  
18 are scheduled for summer construction?

19 A I don't know the details  
20 of the proposed construction, no.

21 THE COMMISSIONER: The crossing  
22 of Shallow Bay is to be carried out in the summertime.

23 A I see.

24 MR. GIBBS: Have you pinpointed  
25 any sources of gravel and determined how that gravel  
26 would be transported for the Shallow Bay crossing?

27 A Not specifically for  
28 that project, although other offshore activities involving  
29 gravel are conducted using barges and dredging and  
30 soforth.





1 Q Well, aren't you going to  
2 have to have one of two things, or maybe both. A  
3 semipermanent or permanent road, plus loading facilities  
4 for the barges.

5 A In the case of truck  
6 hauling in the summer months, a semi-permanent  
7 road may be required. Certainly, it's very difficult  
8 to say. Some operators at the moment are stockpiling  
9 gravel offshore, for example, on the spit and Garry Island.  
10 Granular material from Yaya Lakes has <sup>been</sup> stockpiled there.  
11 In the summer months this is taken onto barges and moved  
12 to the site where it's required for sandbags, or for  
13 whatever other purpose. So, I can't say that in this  
14 specific operation, that this work couldn't be done,  
15 and therefore that permanent barge pads would have to  
16 be constructed.

17 Q Have you any knowledge or  
18 made any assessment of the amount of <sup>borrow</sup> material which  
19 will be required as backfill in the Shallow Bay crossing,  
20 by Arctic Gas?

21 A No, I haven't.

22 Q You have not. Have you  
23 made any calculation as to the size of the trench which  
24 may exist in the Shallow Bay crossing and have to be  
25 filled with backfill?

26 A No, I haven't.

27 Q Do you know anything about  
28 how Arctic Gas proposes to excavate the trench in  
29 Shallow Bay crossing?

30 A No, I don't.



Inglis, Speller  
Cross-Exam by Gibbs

Q Would it be within your knowledge to expect that for buoyancy control, if for no other reason, that gravel will be required in the trench in the Shallow Bay crossing?

MR. MARSHALL: Well, this <sup>his</sup> witness is a biologist by C.V., sir. It seems to me Mr. Gibbs is asking him to go outside of his area.

MR. GIBBS: Well, as a biologist he came along and gave his full evidence on borrow material.

MR. MARSHALL: I will deal with that later.

WITNESS INGLIS: The fact of the matter, sir, is that I have not reviewed the engineering proposal presented by Arctic Gas, and therefore I am not competent to discuss engineering. What I am involved in is assessing the supply and demand of granular material for projects in the delta area, and I'll comment on that. I can only make certain assumptions about what will be required in the Shallow Bay area. It may well be that gravel is required, and I know that a small quantity of granular material was identified in the Arctic Gas submission for backfill.

MR. GIBBS:

Q In identifying the supply and demand for <sup>borrow</sup> material in the delta area then you have taken as your demand figures those figures which have been contained in submissions to Indian Affairs?

A That's correct, and I've noted in my presentation that these are only partial



Inglis, Speller  
Cross-Exam by Gibbs

1 estimates, that the major -- perhaps the major portion  
2 of the ultimate demand, that is for trench backfill,  
3 and for berm construction have not been provided, figures  
4 have not been provided for those items .

5 Q Have you taken any steps  
6 or have you any underway to ascertain of your own  
7 estimate, what the gravel materials will be?

8 A Without knowing the  
9 design features of that crossing, it's entirely  
10 impossilbe to even speculate on what those requirements  
11 might be. What the trench conformation is, what the  
12 berm configuration will be; until that type of  
13 detailed information is provided, we certainly can't  
14 make estimates. It would be unreasonable to make such  
15 estimates based on material we have at present.

16 Q  
17 Well you have all of the  
18 Arctic Gas material that's been filed before this  
19 Inquiry, sir, including the very recent volume that I  
20 read from?

21 A That's right.

22 Q And you have not been  
23 able to find anywhere in that material sufficient  
24 detail as to cross-delta design to enable you to make  
25 independent estimates of gravel demand?

26 A The material may exist,  
27 but I haven't attempted to assess the requirement, no.  
28 I'm mainly --

29 THE COMMISSIONER: You simply  
30 adopted those figures.

31 A That's right. That's what





Inglis, Speller  
Cross-Exam by Gibbs

1 we have to -- we thought that that was the best  
2 available information at the time that we were compiling  
3 our list.

4 MR. GIBBS: All right sir, back  
5 to my other question. Are you in the process of or do  
6 you intend to make your own independent assessment of  
7 what the gravel material requirements will be?

8 A I can't say what approach the  
9 department will take. I haven't been asked specifically  
10 to do this work, and I can't forecast whether this will  
11 be done or not.

12 Q Then all that you can offer  
13 by way of estimates of demand are totals of numbers  
14 which have been presented to Indian Affairs by applicants?

15 A That's the basis on which  
16 I'm working at the moment.

17 MR. GIBBS: Those are all my  
18 questions, sir.

19 MR. MARSHALL: I understood  
20 I was in the usual batting order next, or last. Mr.  
21 Gibbs had asked if he might go first.

22 THE COMMISSIONER: Well, then  
23 Mr. Gibbs will be certain of getting on the plane.

24 MR. MARSHALL: I guess that's  
25 the way it goes sir. He's not booked out tonight.

26 THE COMMISSIONER: All right,  
27 who's next?

28 MR. EVANS: That would then  
29 make me next, I believe, Mr. Commissioner.

30 CROSS-EXAMINATION BY MR. EVANS:



Inglis, Speller  
Cross-Exam by Evans

1 Q Now Dr. Speller, on page  
2 16 of your prepared testimony, you referred to the  
3 possibility of affording wildlife protection through  
4 notam regulations or regulations under the Canada  
5 Shipping Act. I wonder if you could provide us with  
6 more detail and insight into what inter-agency processes  
7 would be involved to get such regulations established.

8 WITNESS SPELLER: You mean as  
9 I see it in terms of the biological aspects involved  
10 in establishing a notam?

11 Q Yes.

12 A I think what we're looking  
13 at here is certainly the corridor -- a corridor system  
14 first off, a corridor system that has been recommended  
15 by many of the applicants involved with development in  
16 the north-- in <sup>the</sup>delta region, pardon me. I think we're  
17 looking at elevation restrictions on aircraft, and I  
18 think we're looking at these regulations being  
19 established in relation to the distribution, movements,  
20 and in some cases, productivity of species from one  
21 year to the next, as the delta developments proceed,  
22 whichever they may be. Those are some of the issues  
23 that would be involved in establishing notams as I see it.

24 Q Well, how would you  
25 propose to enforce these? Would they be enforced by the  
26 usual officers, or would wildlife officers have the  
27 power to enforce them?

28 A As I understand it, the  
29 notam -- the way the system operates in southern Canada,  
30 the Ministry of Transport would be responsible for



Inglis, Speller  
Cross-Exam by Evans

1 regulating the activities of aircraft, according to the  
2 jurisdictions of that notam.

3 Q Well how about --

4 A Now, I imagine there's  
5 several ways. For instance, we know that on the outer  
6 edges of the delta, during summer -- we are told that  
7 we will probably have large operations by Arctic Gas,  
8 for instance, crossing<sup>the</sup>/delta -- constructing a pipeline  
9 across the delta. We're going to see very large  
10 communication centers perhaps, established at each of  
11 the three gas plants. During May and June we're looking  
12 at extremely foggy conditions, variable conditions in  
13 weather. For instance, if that notam -- and we're also  
14 dealing with the fact that especially on the outer regions  
15 of the delta, around Niglintgat, and around Taglu, we're  
16 dealing with nesting migratory birds. If a notam was  
17 established in the areas where these birds are breeding,  
18 and perhaps in a three or four mile radius around,  
19 indicating that aircraft shall maintain an altitude of  
20 1,250/<sup>feet</sup> then communications between Inuvik, where planes  
21 are likely to be taking off, and between their destination  
22 sites, which would be helicopters and aircraft flying  
23 of course out to these development areas, the communication  
24 centers between these, between MOT and individuals or  
25 personnel, and between company personnel, the ceiling  
26 would be noted at the proposed landing site.

27 If that aircraft or that pilot  
28 did take off, and he did break those regulations, then,  
29 in my opinion, the Ministry of Transport officer would  
30 have sufficient evidence on his hands in order to take





Inglis, Speller  
Cross-Exam by Evans

1 the appropriate action necessary, that is perhaps legal  
2 action.

3 Q Well how about other kinds  
4 of legislation and regulations that aren't generally  
5 considered to be wildlife oriented? You mentioned I  
6 think the Canada Shipping Act. I'm sure there are many  
7 others. Would you propose that these be enforced by the  
8 wildlife personnel?

9 A No. What I'm looking for  
10 here is, as I stated in my brief, I'm looking for the  
11 regulation of -- or the protection of migratory birds.  
12 I want to see the protection of migratory birds  
13 established under regulations, air regulations, air  
14 traffice regulations rather than what might be loosely  
15 termed as the environmental regulations under which birds  
16 are protected now.

17 In other words, recommendations  
18 that are produced by the Canadian Wildlife Service,  
19 shall we say, in a migratory bird sanctuary permit. As  
20 you realize, the migratory bird sanctuary regulations  
21 control the habitat of the bird, but they do not control  
22 the activities, or they do not have any control over  
23 the activities of aircraft.

24 Similarly, land use regulations.  
25 Recommendations are given to companies, you know,  
26 altitudes,  
27 maintain certain controls and/ but again that's -- that  
28 legislation I don't believe is as strong as it might  
29 be if it were established under air regulations,  
30 controlling a pilot. So that is my philosophy involved  
in this.



Inglis, Speller  
Cross-Exam by Evans

1 Q So in other words, you're  
2 proposing that we make fuller use of the existing  
3 legislation --

4 A Right.

5 Q -- legislation that is  
6 not necessarily wildlife oriented.

7 A At this time, right. I'm  
8 just suggesting that we introduce the protection of  
9 wildlife under existing air regulations.

10 Q Now, I asked the question  
11 before, and I'm not sure that I understood your answer.  
12 Would you propose that wildlife officers be given the  
13 power to enforce these other regulations, or not?

14 A Sir, I'm not an expert on  
15 whether the Ministry of Transport can engage wildlife  
16 biologists to work as -- on the jurisdiction of their  
17 regulations, I'm sorry. It seems to me that as I  
18 understand it now, it would be at least have to involve  
19 Ministry of Transport personnel.

20 Q As well.

21 A Well obviously, as the  
22 law exists now, the Ministry of Transport -- whether  
23 you can bring wildlife people in to assist in the  
24 functioning of that legislation, I don't know.

25 Q Well, do you know of  
26 any specific cases where regulations of an agency not  
27 directly interested in wildlife have been used to protect  
28 wildlife or wildlife habitat?

29 A Would you repeat that  
again, please?



Inglis, Speller  
Cross-Exam by Evans

1 Q Yes. Do you know of any  
2 specific cases where regulations of an agency not  
3 directly interested in wildlife have been used to  
4 effectively protect wildlife or wildlife habitat?

5 A Well I --

6 THE COMMISSIONER: Well if you  
7 don't know, he is suggesting it be done in this instance,  
8 I think it's a suggestion that deserves the most serious  
9 consideration.

10 A I'm a little hesitant  
11 to answer that question. For instance, the Land Use  
12 Regulations --

13 THE COMMISSIONER: Well, they're  
14 concerned with wildlife, aren't they?

15 A That's right, they  
16 certainly are, right, and so it's not -- I can't put  
17 that as an example. No, I can't think of any right now.

18 MR. EVANS: Okay.

19 Now, I believe when Dr. Gunn  
20 appeared as a witness before this Inquiry, he was asked  
21 whether there were any negotiations underway between  
22 the pipeline company/<sup>which</sup> I assume is Canadian Arctic Gas,  
23 and the government with respect to the establishment  
24 of air corridors. He wasn't able to answer that question  
25 not surprisingly, I think; it wasn't something he was  
26 involved in. I wonder if you would know whether these  
27 negotiations are under way?

28 A I'm sorry, I do not know.

29 I concur with Dr. Gunn.

30 Q With respect to specific





Inglis, Speller  
Cross-Exam by Evans

1 legislation, what initiatives do you think could be  
2 taken under the Canada Wildlife Act to meet some of  
3 the potential problems which would arise in the delta  
4 with respect to disturbance of wildlife?

5 A Some of the controls that  
6 one might -- first of all -- you must realize that the  
7 Canada Wildlife Act is a coordination between the  
8 Department of the Environment, and any provincial body  
9 or Territorial body that may be involved. I should also  
10 point out that regulations have not been established  
11 under the Canada Wildlife Act. So at this time, we do  
12 not know what types of powers would be under that Act;  
13 and second of all, we do not know the types of regulations  
14 and types of agreements that could occur between a  
15 provincial body and the Department of Environment or  
16 in the case of the Northwest Territories, it would be  
17 between the Department of Indian and Northern Affairs,  
18 and the Department of Environment; and also -- excuse  
19 me, and also involving the Territorial Government as well.

20 Q Now in your prepared  
21 testimony, you've mentioned the need to protect critical  
22 wildlife habitat, which falls outside of migratory  
23 bird sanctuaries. Is there any possibility that this  
24 could be accomplished through the Territorial Land Act,  
25 or the Land Use Regulations?

26 A Well, at this time, the  
27 Territorial Lands Act, and the Lands Regulations, if  
28 and when a seismic operation does take place in a  
29 critical wildlife area, perhaps we should use the area  
30 around Harry Channel as a good example, because we have



Inglis, Speller  
Cross-Exam by Evans

1 large populations of swans moving in about that area.  
2  
3 Certainly the Land Use -- when these seismic operations  
4 did appear within the Land Use Advisory Committee, there  
5 were specific recommendations made to the Department  
6 of Indian Affairs, discussing special conditions that  
7 were required in order to ensure that the habitat in  
8 that area was well protected.

9 Q Under Section 21 of one  
10 page of the Territorial Lands Act, allows terms and  
11 conditions to be established on a permit, to protect  
12 wildlife habitat. Do you know of other existing  
13 legislation that might be applied directly or indirectly  
14 to protect wildlife or wildlife habitat?

15 A I suspect that under the  
16 Arctic Waters Pollution Prevention Act, that there could  
17 be conditions to protect wildlife incorporated in the  
18 environmental conditions attached to a drilling authority  
19 for offshore drilling. That's another example where it  
20 could be used. I'm not saying right now that there have  
21 been any specific examples written into legislation, but  
22 there is an opportunity there, if the situation arose.

23 Q Now, with respect to the  
24 Migratory Birds Treaty Act and regulations, is there any  
25 possibility of using it beyond the scope of establishing  
26 hunting seasons and bag limits, the protection of habitat  
27 within sanctuaries? Do you see any other possibilities  
28 under that Act and regulations for protecting wildlife?

29 A Well, in essence, Migratory  
30 Birds Sanctuary regulations have extreme power to control  
the activities of singular or groups of human beings or



Inglis, Speller  
Cross-Exam by Evans

1 any type of activity, in the interests of preserving and  
2 protecting the species which occur within the boundaries  
3 of the Migratory Bird Sanctuary. In other words, the  
4 Canadian Wildlife Service has the power to control the  
5 operations of vehicles, the numbers of vehicles, the  
6 types of vehicles, it even has the opportunity -- it has  
7 the ability to control the numbers of people and the  
8 activities of people in the areas where people go, even  
9 within a migratory bird sanctuary. It even has the right,  
10 and I believe there's one case, to absolutely eliminate  
11 human activities within a migratory bird sanctuary. This  
12 is I believe on the gannet colonies on Bonaventure Island.  
13 The power exists there.

14 Q Well I was thinking more of  
15 areas outside of sanctuaries.

16 A No, well the Migratory Bird  
17 Sanctuary regulations refer to the sanctuary.

18 Q I'm not as familiar as you  
19 with these regulations. Are there other regulations  
20 under the -- I would have thought there were other  
21 regulations under the Act, that might be applied.

22 A Not to the degree of course  
23 that -- well this is why we have the Territorial Land  
24 Use regulations, because these fill that gap, the  
25 requirement there to protect the habitat of wildlife,  
26 fisheries, etc., that were outside of special areas like  
27 this.

28 Q How about other Acts? Were  
29 there particular provisions in some of the other related  
30 legislation that would apply, that you can discuss?





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Q Well how about --

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Inglis, Speller  
Cross-Exam by Evans

1 Territorial Land Use regulations and the Canada Migratory  
2 Bird regulations, that conditions can be established to  
3 protect wildlife habitat or wildlife populations, before  
4 a development goes in; whereas unfortunately many other  
5 pieces of legislation are after the fact.

6 Q So, there appear to be  
7 a lot of different Acts and regulations that could  
8 potentially be used to control damage to wildlife in  
9 the delta.

10 A Yes.

11 Q Is the Department of Indian  
12 and Northern Affairs working on any masterplan to  
13 coordinate these, and coordinate management protection  
14 of species in the delta?

15 A I am not aware of any  
16 masterplan that the Department of Indian and Northern  
17 Affairs is organizing.

18 Q Is that a concern of yours,  
19 to coordinate all of this?

20 A Well as I -- yes, it is,  
21 I think that the -- with regards to protection of wildlife  
22 from  
23 /fuel spills, aircraft, people, that obviously the  
24 cooperation of industry, the cooperation of government,  
25 cooperation of communities is going to be required in  
26 order to develop the types and pieces of legislation  
27 that will be required in order to preserve and protect  
28 the interests of wildlife in this area, over the long  
29 term.

30 Q Well do you think that you  
should be working on such a masterplan?



Inglis, Speller  
Cross-Exam by Evans

1                   A     I think that it is time,  
2     yes. I believe I indicated that in my testimony.

3                   Q     Okay. There are a couple  
4     of things in your prepared testimony that I'd like you  
5     to clarify. Now, on page 4 you say, for the record,  
6     "the developments which I wish to include are," and then  
7     you list seven of them, the first of which is the  
8     Mackenzie Valley Pipeline. Now, would I be right in  
9     assuming that that's gas pipeline that's proposed?

10                  A     Yes.

11                  Q     You didn't consider the  
12     possibility of an oil pipeline? I understand that there  
13     is a proposal, now in preparation.

14                  A     I must admit that my -- the  
15     main emphasis in / <sup>considering</sup> this was for a gas pipeline.

16                  Q     I see. <sup>So</sup> / that is within  
17     the terms of reference of this Inquiry.

18                  A     Yes.

19                  Q     I thought you might have  
20     looked into the possible effects of it.

21                  A     I think that my testimony --  
22     I considered such things as large oil spills, which  
23     would be associated with an oil pipeline.

24                  THE COMMISSIONER: Well, your  
25     remarks apply generally to the impact of all of these  
26     developments, and I think that -- I doubt that they  
27     would have been very much different if you had included  
28     the oil pipeline in there.

29                  A     No sir, I don't think so.

30                  Q     I wonder if you could





Inglis, Speller  
Cross-Exam by Evans

1 clarify for me the current status of the Arctic Land Use  
2 research program in your department, how it related to  
3 the Environmental Assessment Program?

4 A The --

5 Q I might add that the  
6 reason I ask you about that is Mr. Longlitz testified  
7 a few days ago, and he was unable to respond in any  
8 detail to that question, and suggested we ask you.

9 A The Arctic Land Use Research  
10 Program, the relationship I have to that program is as  
11 a wildlife advisor. Now the program itself is established  
12 and is organized within the Department of Indian and  
13 Northern Affairs. It is advised by a committee, what is  
14 called an ALUR Committee, which is made of Industry  
15 representatives, as well as northern expertise from the  
16 universities across Canada. Monies are set aside by  
17 the Department each year for research that will be  
18 associated, or that research -- for research associated  
19 with any and all developments that may take place in  
20 the Northwest and Yukon Territories, so that when people,  
21 when you have input for instance on mining, land use  
22 and petroleum exploration, and I could go forestry,  
23 forest fires, this sort of thing, In other words the  
24 ALUR Program satisfies the research needs of the Water,  
25 Lands, Forests and Environment branch of the Department  
26 of Indian and Northern Affairs.

27 Obviously there is not an unlimited  
28 source of research funds. There are proposals coming in  
29 from everyone, everywhere, at all times, so it is the  
30 responsibility of the individual who heads the ALUR



Inglis, Speller  
Cross-Exam by Evans

Committee, plus the members of that Committee, to decide in their own minds, what research should be supported, where research is necessary, in order to try and solve more pressing problems that are associated with developments in the north and the effects on the environment. I should also say that the Land Use Advisory Committee -- I myself while I sat on the committees, we passed up recommendations for studies. These were given to the chairman of that committee, and then in turn they were reviewed and passed on to <sup>the</sup> ALUR Committee, and the ALUR head in Ottawa, for consideration. So that, do I give you a general idea of how it operates and how it works?

Q Yes, I think that's what we were looking for. Well, so the proposals come in from the various organizations, and then your organization in Ottawa makes a decision?

A Yes.

Q Well who does this research? Is it within the Department, or is it <sup>through</sup> universities?

A Research -- no, I want to make it quite clear that the Department of Indian and Northern Affairs biologists do not do the work, that we are the advisory segment. We are not the field functioning organization. That is the responsibility of the Department of the Environment. If and when a project is chosen, an amount of money that the group feels should be attached to that program is attached to it, then we go through the B.S.S. bidding system, in which case that four say consultant companies and university officials



Inglis, Speller  
Cross-Exam by Evans

1 are notified that the project is being proposed by the  
2 Department of Indian and Northern Affairs, and that a  
3 bid is solicited. Those bids are then reviewed, the  
4 expertise of the people involved, the financial require-  
5 ments of those people, and a contractor is selected.

6 Q Now Dr. Speller, you  
7 discussed the impact on wildlife from a number of sources,  
8 and a need to mitigate them. Would you agree that it  
9 would be necessary to establish some system of evaluating  
10 the effect of these impacts on different species, if  
11 effective countermeasures are to be taken?

12 A Obviously there is a need  
13 for more research in specific areas of northern Canada,  
14 and on specific species, which will be affected to one  
15 degree or another by the various developments that I've  
16 looked at in this case, yes.

17 Q On page 6 of your prepared  
18 evidence, you specifically refer to the possibility of  
19 serious disruption of the activities of waterfowl  
20 populations in the outer delta. What data would it be  
21 desirable to have on these populations prior to  
22 construction, to allow the effect of activities to be  
23 properly evaluated?

24 A I must express my personal  
25 opinion here, in saying that research -- there's been  
26 large numbers of observations of <sup>the</sup> effects of aircraft on  
27 waterfowl. Certainly the information provided in the  
28 research by the consultants for Arctic Gas indicated  
29 that on the North Slope we've seen the effects of  
30 aircraft at very high altitudes, and how geese have





Inglis, Speller  
Cross-Exam by Evans

1     apparently flushed. We also -- I am also aware of the  
2     reports by Dr. Barry, again these are personal  
3     observations, where helicopters have landed extremely  
4     close to birds. They have not moved, and only when the  
5     individual alighted from that helicopter, or whatever the  
6     aircraft was, that the birds were frightened. In  
7     other words, we're dealing with extremes in behavior  
8     of animals at different times of the year, we're dealing  
9     with different species of waterfowl. There is no doubt,  
10    that given enough time and enough money and enough effort,  
11    that we could get to the bottom of these behavioral  
12    reactions, and understand them completely and thoroughly.  
13    But then we're forced at the same time to consider  
14    regulations for a large number of operations that are  
15    going to be taking place in the delta; and with the  
16    development of regulations, comes a practicality.

17                   The practicality of establishing  
18    a rule and a regulation that's consistent, meaningful,  
19    and that people can follow; and so it would be useless,  
20    at least in my mind, to say to a helicopter pilot, "well  
21    today, within this one mile stretch        you can operate  
22    200 feet but you must immediately arise to 1,200 feet  
23    over this 2 mile stretch, and then drop down to 500 feet  
24    if you wish to elevate there." These sort of regulations  
25    are ridiculous, because people have jobs to do, people just  
26    can't follow detailed instructions.

27                   So what we're looking for is  
28    a regulation that can be applied over reasonably wide  
29    areas, and to be as practical as possible, for people to  
30    operate within. And so, my answer coming back again here,



1 is, is it research that we need, or is it sound  
2 development of regulations, and the enforcement of those  
3 regulations? Where are you going to put your money;  
4 and I think these are the some of the problems that this  
5 ALUR Committee has to face, and that all of us in  
6 government have to face, with the expenditure of research  
7 funds.

8 Q Well I don't know that  
9 you really answered my question, although that's a very  
10 interesting statement. What I'm really wondering is  
11 whether you think we have sufficient data right now, in  
12 order to make regulations?

13 A I personally believe that  
14 if I had the freedom to establish the regulations, the  
15 way I wanted to see them, that I/could protect the interests  
16 of those birds.

17 THE COMMISSIONER: You've got  
18 enough to go on now, that's what you're saying?

19 A Personally, I feel, right;  
20 with the proper regulations, with the proper enforcement  
21 of those regulations, that I think I could protect the  
22 interests of the birds and the wildlife; the birds  
23 populations especially, in the outer edge of the delta.

MR. EVANS:

24 Q Well, would you agree that  
25 it would be better to have more data?

26 A Well, of course, anyone  
27 would like to have more data on which to inform --

28 Q Well, I'm informed that  
29 available data is pretty limited.

A It is; but, you know, how



Inglis, Speller  
Cross-Exam by Evans

1 many years of information are we looking to collect? You  
2 know, how long will it take to gather this information?  
3 And the second thing is, how practical is it going to  
4 be for the establishment of meaningful regulations?

5 Q Well, would it be feasible  
6 to proceed on two levels? On one side you'd have the  
7 regulations and try to enforce them, and on the other  
8 side you'd be trying to gain the data necessary to  
9 find out whether they were the right regulations.

10 A I think that'd be a  
11 practical suggestion, yes.

12 Q What kind of data would  
13 you be looking for?

14 A I think <sup>we'd</sup> want to know  
15 more about some of the seasonal changes in the behavior  
16 of species and how effects of nutrition, and the effects  
17 of seasonal variability, how it influences the animals'  
18 behavior to extraneous inputs into their environment,  
19 such as aircraft, such as barges.

20 Q Now again, I am informed  
21 that we presently don't have detailed population  
22 instruments. Is that something you'd like to --

23 A What are you talking about?

24 Q -- of the waterfowl, in  
25 particular. Was that a statement you'd take issue with?

26 A Well, the populations of  
27 waterfowl are extremely variable on the outer edges of  
28 the delta; varying with the amount of productivity that  
29 takes place each year, and with the number of flocks of  
30 the waterfowl that come to north, variable, extremely





1 variable, from one year to the next.

2 THE COMMISSIONER: I think we've  
3 heard --

4 A I mean, Dr. Barry, I think,  
5 has referred to --

6 THE COMMISSIONER: Yes, we  
7 heard from Dr. Barry at length, who apparently knows  
8 as much about it as anyone in the world, and we're  
9 hearing from Dr. Gunn; and between the two of them,  
10 there's not much left to be said. I hope there's not.  
11 Dr. Barry gave us some population figures for a number  
12 of species, but --

13 MR. EVANS: Yes, I believe he  
14 did, but I'm merely trying to make the point that we  
15 need a lot more information.

16 THE COMMISSIONER: It's a  
17 matter of argument. Dr. Speller says he's got enough  
18 to go on. He could frame some practical regulations  
19 provided he could get MOT to enforce them. That's  
20 his argument and I don't think it's necessary to --

21 MR EVANS: I'm not taking  
22 issue with that argument that he's making.

23 Q Okay, page 4 of your testimony  
24 you make reference to rating the magnitude of the  
25 impacts on wildlife. Could you suggest how <sup>you'd</sup> go about  
26 doing that?

27 A Well, what I'm referring  
28 to here is that in any environmental assessment, when  
29 it's dealing -- let's take a major development -- one  
considers a variety, or the variety of the different



Inglis, Speller  
Cross-Exam by Evans

1 operations that are encompassed within that program.  
2 One also is required to look at the various species  
3 in the area of that operation, and the characteristics  
4 of the behavior, the habitat selection of those species  
5 in that area; and then one goes through a very detailed  
6 process, whether mentally or on paper, both to look at  
7 each aspect of the development that takes place, and  
8 mark that against the possible effects that these will  
9 have on a species at a particular phase in its life cycle,  
10 or even annual cycle.

11 When you do that, you are  
12 looking at--you can then attempt to assess the magnitude  
13 of the impact. For instance, a major oil spill, this is  
14 something one considers. Then you consider the season  
15 when that spill may take place. And if it happens  
16 during the period when you have massive numbers of  
17 adult birds and their young broods in the way of that  
18 spill, you now have a very major potential impact, and  
19 you would rate that very high; whereas on the other  
20 hand, you can consider the activity perhaps of workmen  
21 wandering about their development site. You consider  
22 the fact that you may only have a few workmen, you may  
23 consider that the activities of workmen will be taking  
24 place in the wintertime. Therefore this impact would  
25 be very low. That's what I mean by assessing the  
26 magnitude of various impacts.

27 Q You consider this to be  
28 an important function?

29 A That's my job, sir.

Q I'll assume that's a "yes"



Inglis, Speller  
Cross-Exam by Evans

1 answer. I wonder if you had any thoughts on recommendation  
2 on ways by which activities of the various enforcement  
3 organizations such as the R.C.M.P., the Canadian Wildlife  
4 Service, the Territorial Game Branch, the Fisheries and  
5 Marine Service, could be coordinated to make enforcement  
6 of fishing and hunting regulations more effective?

7 A Unfortunately, I'm not  
8 an expert on the enforcement activities of each and  
9 every one of those operators. I would suggest, however,  
10 that the integration of enforcement personnel is  
11 extremely important. I think Mr. Trudeau yesterday  
12 indicated where land use operators, or land use  
13 inspectors of the Department of Indian and Northern  
14 Affairs, cooperate with the Fisheries and Marine Service  
15 inspection officers. I should also add one more, is that  
16 that Canadian Wildlife Service had an inspection officer  
17 here, and he was also involved in this, and that between  
18 the three of them, they<sup>co-ordinated</sup> and cooperated in  
19 such a way that almost all operations were covered at  
20 least once, and that a great deal of information was  
21 attained, and because they exchanged information,  
22 everybody was kept at a much higher level of information  
23 of what was going on in the delta in any particular  
24 problems that they sought. But coordination is a very  
25 important thing.

26 I think also, too that industry;  
27 the cooperation of industry must be solicited and  
28 obtained, and also education programs as well  
29 with local people.

Q Well, would you agree that





1 there's a considerable amount of overlap between these  
2 various enforcement agencies?

3 A In the delta region, now,  
4 yes. I can only speak of the delta, and I'm certain  
5 there's always room for improvement.

6 Q So their coordination could  
7 improve?

8 A The coordination exists.

9 Q But it could be improved.

10 A It can always be improved.

11 Q Specifically I was thinking  
12 about aircraft services. Now I imagine there are cases  
13 <sup>which</sup> in/a fisheries inspector goes into an area <sup>and then</sup> /not too long  
14 after that, a game inspector goes in, <sup>and</sup> /maybe the wildlife  
15 service people would go in.

16 THE COMMISSIONER: Somebody  
17 from Foothills, and then from COPE, and then from the  
18 Inquiry.

19 MR. EVANS: I was just wondering  
20 if it might not be possible for them all to get together  
21 and go in at the same time, and if that's something that  
22 you might conceive?

23 A Well, I think that --

24 MR. GIBBS: One can have all  
25 sorts of ideals, but it seems to me we're going a bit  
26 far to expect this witness to coordinate everybody at  
27 once going into any particular area. If there's overlap,  
28 maybe we're over-policed but, in my respectful  
29 submission we're straying a little bit beyond the topic  
30 at hand.



Inglis, Speller  
Cross-Exam by Evans

1 THE COMMISSIONER: I think we  
2 all agree that that's desirable, Mr. Evans, and I think  
3 people concerned about public expenditures, who haven't  
4 the faintest interest in the environment, would be  
5 anxious to collaborate with you in developing some means  
6 of reducing the number<sup>of</sup> flights that government personnel  
7 and private companies are involved in. Well, anyone who's  
8 been up here for any length of time has noticed that;  
9 no one's come up with the answer.

10 MR. EVANS: I'm not going to  
11 pursue this question, but maybe we could just have the  
12 witness answer it.

13 THE COMMISSIONER: Well, if you --  
14 A  
15 Let me say it this way, that there's two ways to  
16 cooperate. You can get all three men in the same  
17 helicopter, and go out and see the same project, or you  
18 can ask one man to do the job of two; and, you know,  
19 whichever works best, if any. Let's leave it up to  
20 the enforcement people to figure it out.

21 Q Either of those would be  
22 reasonable suggestions.

23 THE COMMISSIONER: That pretty  
24 well guarantees they won't be pursued. Anyway let's  
25 carry on.

26 MR. EVANS:  
27 Q On page 15 of your testimony  
28 you discuss the impact of population expansion and  
29 tourism. You rate the accumulative impact of people on  
30 wildlife resources as one of the most difficult for  
wildlife managers to solve. Do you have any specific  
recommendations about what should be done in advance to  
mitigate the shockwave that you think will result from



Inglis, Speller  
Cross-Exam by Evans

1 pressure of increased population?

2 A I think it's very important  
3 for management agencies to have a clear handle on the  
4 ecology of the species that are likely to be most  
5 affected by people disturbances. I would suggest that  
6 these are perhaps, migratory birds that do form into  
7 large flocks. It seems to me that species that form into  
8 large groups are the animals that are most -- that most  
9 people wish to see.

10 So consequently you must  
11 hopefully determine the distribution and movements of  
12 these animals and then limit the number of people coming  
13 in visual contact unnecessarily, or the amount of dis-  
14 turbance that these people will have on wildlife, on  
15 those species. It oftentimes means the establishment  
16 hopefully of wildlife areas under a variety of different  
17 legislation in order to regulate this.

18  
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Inglis, Speller  
Cross-Exam by Evans

Q Now, earlier today in response to a question by Mr. Gibbs you, I believe, agreed that climatic conditions and lack of water fowl during winter would result in very little disturbance of wildlife from workers moving out from oil rigs. How about during the summer?

A I think <sup>this</sup> is where my concern lies, as I indicated in my testimony. It was with pipelining operations across Shallow Bay; also, the gas plant construction that will be taking place during summer. I believe that the environmental conditions are certainly much better than in the winter and I believe that workmen will see large groups of birds moving up through the channel areas, perhaps they will be very interested in the number of the birds that they see nesting around them. There's going to be a larger number of people attracted to view these birds at closer range.

There's also the opportunities for fishing and in fishing, or getting to a fishing hole, or whatever it may be -- or a fishing lake -- one is going to have a greater opportunity to encounter birds.

Q Well, to deal with that problem, would you be in favor of as much work as possible being done in the winter?

A No, I think that -- here again, that I would look to the companies trying to enforce their manpower to stay in close proximity to the areas where they're working; as closely as possible.

Q On page twelve of your testimony you referred to -- in referring to the level



Inglis, Speller  
Cross-Exam by Evans

1 of disturbance from major construction you stated that  
2 it would be serious, especially if small boats and  
3 vehicles are made available for recreation purposes  
4 to the workers. Do you think that that -- that there  
5 should be restrictions on the definitions of those things?

6 A Definitely. You know,  
7 we're aware now that in some cases, a boat may be ob-  
8 tained by workmen operating at an exploratory drill site  
9 in the delta and that this boat is used to take workmen  
10 or to carry workmen out to a fishing area. In fact, F.F.  
11 Slaney, in their report -- in their -- for Shell Canada  
12 for the Niglintgak operation indicated that this might  
13 be a problem.

14 Q Now later on the same  
15 page in discussing the affects on Inuvik of transient  
16 population pressure, I wonder if you would recommend  
17 that access of workers to Inuvik be severely restricted?

18 MR. MARSHALL: I think here,  
19 you're far out of the witnesses area of competency, sir.

20 MR. EVANS: Well, he has made  
21 a statemnent in his evidence and would lead me to believe  
22 that he would make such a recommendation and I merely  
23 want to elicit from him whether or not that's his  
24 opinion.

25 THE COMMISSIONER: What was  
26 the question again?

27 MR. MARSHALL: Keeping workers  
28 out of Inuvik.

29 THE COMMISSIONER: Oh, that's  
30 a social impact question, I don't think Dr. Speller's



Inglis, Speller  
Cross-Exam by Evans

1 view are, well -- this is of as much weight as most  
2 other people's -- everybody seems to want to keep them  
3 out of Inuvik, except to go in there and make some  
4 appropriate purchases of goods.

5 MR. EVANS: Maybe we could  
6 buy them by catalogue.

7 THE COMMISSIONER: Then to get  
8 out swiftly after that.

9 MR. MARSHALL: Having left  
10 their money behind.

11 MR. EVANS: Well, I guess it's  
12 not important enough to pursue it.

13 THE COMMISSIONER: It's very  
14 important.

15 MR. EVANS: Well, it's an  
16 important Mr. Commissioner, but not one that Dr. Speller  
17 can probably add very much to. I certainly didn't  
18 mean to infer I didn't think that population pressure  
19 on Inuvik was important. Mr. Inglis, on page eight of  
20 your prepared testimony, you state that it's a require-  
21 ment under the Territorial Land Use Regulations that:

22 "drilling sumps be backfilled using excavated  
23 material to the original ground surface level."

24 Now, I can't exactly put my finger on it, but I think  
25 some place in there you stated that because <sup>of</sup> the fact  
26 that there was high ice content in the ground in a lot  
27 of these areas, that fill would have to be imported. I  
28 wondered if you thought that would be more damaging than  
29 possibly leaving the sump not completely filled?

WITNESS INGLIS: Well, the





Inglis, Speller  
Cross-Exam by Evans

1 Departmental policy is quite/<sup>clear</sup>inasmuch as it is part of  
2 the Territorial Land Use Regulations and the operator  
3 must comply with the regulations. There's no doubt about  
4 that and so that the inspectors generally insist that the  
5 sumps are backfilled. I think, however, that personally  
6 in some cases it would be preferable to come to some  
7 other arrangement where insufficient materials/<sup>are</sup>available  
8 rather than dump 20,000 yards of rather expensive resource  
9 just to satisfy the requirements now. Obviously, this  
10 is a quandry that the Land Use officials find themselves  
11 in.

12 On the one hand they have to  
13 comply with the regulations, on the other hand they have  
14 to conserve the resource.

15 Q Yes. When you said "expen-  
16 sive" in what sense did you mean that?

17 A Well, when you have a very  
18 limited quantity of material where there may ultimately  
19 be conflicting demands for that resource, it certainly  
20 does become an expense in that sense to fill up holes in  
21 the ground with it. Because, otherwise, if you deplete  
22 the resource in backfilling sumps, then ultimately an  
23 operator may have to go farther away; his costs rise,  
24 etc.

25 Q Well, what I was really  
26 getting at was that would you agree there is an envir-  
27 onmental cost as well as a financial cost?

28 A Oh yes.

29 Q Yes.

30 THE COMMISSIONER: Well, I think



Inglis, Speller  
Cross-Exam by Evans

Mr. Evans, we'll adjourn for coffee.

MR. EVANS: Well, if you wish Mr. Commissioner, I don't have many more questions for these witnesses, but, very well.

THE COMMISSIONER: Well I -- just before we adjourn, I'd like to say that we have a present for Mrs. McInnes who's treated us very well while we've been here; tea and coffee and goodies and we all want to thank you Mrs. McInnes. Coffee?

(Applause)

(PROCEEDINGS ADJOURNED AT 3:15 P.M.)

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: We'll come to order again ladies and gentlemen and Mr. Evans can with a question or two, I'm sure, conclude his cross-examination.

MR. EVANS: Yes, I only have a very few questions for Mr. Inglis and I will have completed my cross-examination. On page ten of your prepared testimony, you state that :

"Inuvik will require approximately 3 million cubic yards".

Then, farther down you state that if there's industrial activity, maybe as much as seven million cubic yards.

Who's estimates are those?

WITNESS INGLIS: I think I state on the --

Q According to the Government of the Northwest Territories, is that based on information from industry or their own statistics?

A According to the -- I state



Inglis, Speller  
Cross-Exam by Evans

here that:

"According to the Government of the Northwest Territories Inuvik will require approximately three million cubic yards",

and then go on to say:

"A report prepared by Makale Holloway and Associates for the Government of the Northwest Territories indicates that industrial development may require as much as three or four million cubic yards."

They, in fact, made the Makale, Holloway and Associates make the original estimate for the town as well. These are all Government of the Northwest Territories figures.

Q But it was all based on information from the Government.

A From Makale's report to the Government of the Northwest Territories.

Q Yes, I know but I mean they based -- they must have based their calculations on some data and I assume the data came from the Government?

A Makale, Holloway and Associates are the town planners for the Government of Northwest Territories for several of the delta communities if not all of them. It's their job to derive these figures for use of government, not the other way around.

Q O.K. Now on page eleven you state that you've no estimated material demands for an oil pipeline. Would you be prepared to make an estimate?





Inglis, Speller  
Cross-Exam by Evans

1 THE COMMISSIONER: Well, we  
2 have already been given the estimate of the Mackenzie  
3 Valley Research Company which was 40 million cubic yards  
4 of gravel as opposed to 30 million for the gas pipeline.  
5 But that's the only estimate we have and --

6 MR. EVANS: Maybe we could have  
7 this witness' opinion of that estimate.

8 THE COMMISSIONER: Do you know  
9 anything about that?

10 A I have no more information  
11 other than the information that you cite.

12 MR. EVANS: O.K. On page 15  
13 you, in discussing 132 potential sources of material,  
14 you say that 33 are rejected for geotechnical and environ-  
15 mental reasons. Then you go on to state several of  
16 these reasons; high ground ice content and conflicts  
17 with proposed I.P.B. sites and migratory bird sanctuaries.  
18 Do you know if interference with other fragile water --  
19 wildlife habitat was also considered a reason for rejec-  
20 tion?

21 A Well, what happened in this  
22 instance was that in the terms of reference provided  
23 the contractors undertaking the survey, they were required  
24 to identify outstanding environmental concerns associated  
25 with any particular source. The 33 sources I have re-  
26 ferred to here were rejected by the consultants on their  
27 opinion alone as being potentially having a high environ-  
28 mental impact. This is the consultant's opinion. It was  
29 asked from them; they provided it and that's what I've  
30 reported here.



Inclis, Speller  
Cross-Exam by Bayly

1 MR. EVANS: I have no further  
2 questions for these witnesses.

3 CROSS-EXAMINATION BY MR. EVANS:

4 Q Dr. Speller, I understand  
5 from your counsel, Mr. Goudge, that you are in the same  
6 position as Dr. Snow, that you're not at this time pre-  
7 pared to comment on the three land tenure agreement  
8 applications which you are assessing in one of your  
9 capacities.

10 WITNESS SPFULLER: That is  
11 correct. The information in each of those documents is  
12 very preliminary.

13 Q When do you expect to have  
14 the report prepared which will assess these three ap-  
15 plications?

16 A Assess all three together,  
17 or individually?

18 Q Well, I don't know quite  
19 how you're doing it so perhaps --

20 A I believe the plan initially  
21 was that each of the three documents would be considered  
22 individually and then an accumulative impact statement  
23 would be produced on the basis of the assessments of each.  
24 To my knowledge, we have no established timetable in  
25 order to undertake the detailed completion of each of  
26 these. I will depend entirely on the information and  
27 the adequacy of the information provided by those con-  
28 tractors for the -- sorry the individual company.

29 Q The stage at which you have  
30 arrived with regard to these is that you have sent off



Inglis, Speller  
Cross-Exam by Bayly

1 to each of these applicants a series of questions similar  
2 to the pipeline assessment group questions sent off by  
3 Dr. Fyles' group in the early days of that project. Is  
4 that correct?

5 A Right. The department has  
6 done this. In other words, the environmental assessment  
7 section has written this -- prepared this letter, yes.

8 Q The next step will be to  
9 get the responses from each of these applicants prior  
10 to the writing of your report or requesting further in-  
11 formation.

12 A Certainly we've been re-  
13 questing additional information. We've had meetings  
14 with Imperial Oil and with Gulf Oil. We're anticipating  
15 a meeting with Shell Oil, in which case we are asking  
16 for additional information before we complete any studies.

17 Q Would you be publishing  
18 this in stages? In other words, will you be publishing  
19 your requests for further information and the responses  
20 that you get back?

21 A I'm sorry, sir, I have no  
22 idea what the Government policy will be with regards to  
23 publishing our reports, whether it will individually,  
24 or whether the accumulative impact assessment <sup>will</sup> come out.  
25 That's, I'm afraid, a decision that's not in my hands.

26 Q That's somebody else's job?

27 A Certainly sir.

28 Q Yes. Now, my only con-  
29 cern in this, Mr. Commissioner, is that if at some point  
30 prior to the end of the Inquiry, Dr. Speller's and Dr.





Inglis, Speller  
Cross-Exam by Bayly

1 Snow's group is in a position to inform us of the assess-  
2 ment that they have made of the gas plants, that we have  
3 the benefit of that knowledge and perhaps that group  
4 could at least keep in touch with the Inquiry through  
5 Commission counsel so that we will know whether they  
6 will be available.

7 THE COMMISSIONER: Well, I don't  
8 think there's any doubt about that. I'm sure they will.

9 MR. GOUDGE: Yes, we have been  
10 told by the deparment sir, that the report, when it is  
11 completed, will be supplied to us for information and  
12 we'll advise the participants as soon as we get it.

13 MR. BAYLY: It would be at that  
14 time that we might want to consider requesting the  
15 Commission or Commission counsel to bring back both  
16 Dr. Speller and Dr. Snow, but we won't know till we see  
17 their report.

18 THE COMMISSIONER: Right. Well  
19 let's leave it at that then.

20 MR. BAYLY: Just one question  
21 on your evidence that you presented today, sir. That is  
22 with regard to the flight restrictions over bird sanctu-  
23 aries. Now, my understanding is that a permit is issued  
24 to an operator who is doing work in a sanctuary. Do  
25 you understand that from your history with the Canadian  
26 Wildlife Service?

27 A That is correct.

28 Q That permit is issued by  
29 the Canadian Wildlife Service?

30 A That is correct.



Inglis, Speller  
Cross-Exam by Bayly

1                   O     You have told us today  
2     that the Canadian Wildlife Service has no jurisdiction  
3     over aircraft?

4                   A     Activities.

5                   O     Activities?

6                   A     That is correct.

7                   O     Is it not a fact that in  
8     many permits, the Canadian Wildlife Service stipulates  
9     flight altitudes over which the contractor can fly if  
10    he has a permit to work in a bird sanctuary?

11                  A     Sorry, could you repeat  
12    that again?

13                  O     As I understand it, it's a  
14    standard operating condition written into the C.W.S.  
15    permits that flights shall not be below a certain altitude,  
16    those flights being ones that are controlled by the  
17    operator who's been given permission. Is that your  
18    understanding?

19                  A     That's correct, yes.

20                  O     That altitude is 1500 feet.

21                  A     Well, it may be 500 feet,  
22    it may be 1200 feet, it may be 1500. The advice they  
23    are given according to experts such as Dr. Barry who  
24    would of this Kendall Island Migratory Bird Sanctuary or  
25    other individuals who are knowledgeable of the species  
26    involved.

27                  O     You've stated that the  
28    Canadian Wildlife Service doesn't have any control over  
29    this but they do put it into a permit.

30                  A     That's right.



Inglis, Speller  
Cross-Exam by Bayly

1 Q So they can make rules  
2 about it.

3 A They make rules but whether  
4 they would stand up in Court is another matter. The  
5 same thing is true, I should say, for the regulations  
6 established in the conditions established in the  
7 permit issued under Land Use Regulations. It states in  
8 there as well -- it may very well state that aircraft  
9 elevations over a specific area will be such and such  
10 at such and such a period of time, whether than can be  
11 enforced or not. It seems to be some doubt.

12 Q I'm assuming from that  
13 that nobody's every tried to enforce it in a Court?

14 A Yes sir. To my knowledge  
15 no one has tried to enforce it in Court.

16 Q Now, if I could turn to  
17 you, Dr. Inglis and to your prepared evidence at page  
18 five; you've stated in your example in the Immerk B-48  
19 island that 200 thousand cubic yards of fill material  
20 was placed on site but that that may have involved the  
21 dredging of somewhere between half a million cubic yards  
22 to a million cubic yards?

23 WILKES DAVIS: That's right.

24 Q Can you tell me what  
25 happened to the rest of it?

26 A As I understand it, silt  
27 was being dredged and in dumping it on the site of the  
28 island a great deal of this material would be carried  
29 away in the water and not remain on the site of the  
30 island.





Inglis, Speller  
Cross-Exam By Bayly

1                                   O       So the water in the material  
2 from the bottom would cause some of it to flow away, in  
3 fact, more than half of it?

4                                   A       Yes, that's right.

5                                   THE COMMISSIONER: More than  
6 half?

7                                   MR. BAYLY: Oh yes, sir.

8                                   THE COMMISSIONER: Four-fifths  
9 of it, if this is right.

10                                  A       That's correct, yes.

11                                  MR. BAYLY: Yes, it depends  
12 whether it's half a million or a million cubic yards, sir.

13                                  THE COMMISSIONER: Oh yes.  
14 Right, right, right, right, right.

15                                  MR. BAYLY: Now, you've referred  
16 to granular surveys and amounts of granular material  
17 available in the delta area. One of the concerns that  
18 has been expressed from time to time when we've been  
19 examining and cross-examining experts in this field is  
20 with regard to the grades of gravel available and the  
21 grades of gravel or other select material required. Did  
22 the surveys that you are connected with or aware of  
23 contain information as to the kind of material available  
24 as well as the amount.

25                                  A       Yes, the Ripley, Klohn and  
26 Leonoff study provided very limited information on the  
27 quality of material. Estimates were made for quantity  
28 so therefore, the work that the department has undertaken  
29 in the last year or two, together with that -- the work  
30 done by industry in the region has been devoted to



Inglis, Speller  
Cross-Exam by Bayly

1 determining the quality of the material and providing  
2 a better estimate of the quantity of the material toget-  
3 her with such factors as accessibility, workability of  
4 the material.

5 Q This will enable any  
6 regulatory agency, I take it, to determine whether an  
7 applicant for granular material is taking the best or  
8 the suitable material for his project within a given  
9 area.

10 A That's correct, the  
11 aim of the program is to gather sufficient information  
12 about the <sup>granular</sup> materials such that the department would be  
13 in the position of allocating specific qualities to  
14 various operators.

15 Q Because, I take it, one  
16 of the concerns that <sup>you</sup> would have is that the first people  
17 to come along would take the best material, whether they  
18 required that or not, if you didn't know this as a  
19 regulatory agency.

20 A Yes, this is the concern  
21 and this, unfortunately, has happened in the case of  
22 the Yaya Lake <sup>esker kame</sup> complex. The -- probably  
23 the best source of the material in the region are with  
24 I.B.P. reserves.

25 Q Now, on page 14 of your  
26 evidence you refer to the inventory which was carried  
27 out as being of a general nature and you talked about the  
28 methods used; the hand dug test pits, limited drilling  
29 and some field reconnaissance. Does that -- that doesn't  
30 give you an accurate figure of the amount of granular



Inglis, Speller  
Cross-Exam by Bayly

1 material available, I take it?

2 A No, it doesn't.

3 Q Does it enable you to  
4 bracket it? Can you look at a deposit and say, "There's  
5 a minimum of 500 thousand cubic yards and a maximum of  
6 2 million cubic yards," for example?

7 A That rather depends on the  
8 amount of hand test pitting and drilling that was done  
9 on that particular site. For example, on some sites  
10 several holes were drilled and several test pits dug.  
11 In others, perhaps only one or two test pits were dug,  
12 in which case, you'd have to look at each source and  
13 determine what reliance you could place on previous  
14 work. We don't -- we don't take some of these estimates  
15 too seriously because it's impossible to determine the  
16 extent of ground ice in some of the deposits.

17 Q So this inventory may be  
18 only of limited usefulness for the purposes that I've  
19 described and you agreed within the last question?

20 A The Ripley, Klohn and Leon-  
21 off inventory would conform to your statement, yes.

22 Q Are there are others that  
23 are more detailed that you'd be prepared to rely on more?

24 A The work that the Government  
25 is undertaking at the present time -- detailed drilling  
26 programs which were recently completed, in fact, at the  
27 beginning of February will provide the information that  
28 we need -- the type of information that we need to  
29 adequately control those particular sources.

30 Q Now, that refers to par-





Inglis, Speller  
Cross-Exam by Bayly

1        ticular sources rather than a                survey of all the  
2        materials that was carried out by Klohn and Leonoff  
3        and others.

4                                A        Yes, we've just selected  
5        the better sources identified by Klohn and Leonoff and  
6        taken the survey one step further and tried to prepare  
7        better estimates of the material available and the  
8        quality of the material that may be available.

9                                Q        Have you surveyed things  
10       like the deposit of sand that was referred to by one  
11       of the applicants for a gas plant at the Big Horn Point  
12       underneath the river channel?

13                              A        I'm familiar with that  
14       deposit. It's a relatively small deposit and the  
15       department has taken the view that it's with the limited  
16       funds available for this type of intensive work that  
17       there is really little to be gained by kinds of inten-  
18       sive, very expensive work on small areas and so that they  
19       have tended to concentrate on the larger deposits, the  
20       more profitable deposits. It's been left to the individual  
21       companies to carry out the level of detail required for  
22       small deposits that the individual company would be  
23       interested in exploiting.

24                              Q        You're aware of the con-  
25       cern that it may be those small local deposits that the  
26       contractors will look to first, because even though small  
27       they may be very economical for them to move to the site  
28       where they want to do their work?

29                              A        When you say "concern" is  
30       the  
31       this / concern of the companies or the --



Inglis, Speller  
Cross-Exam by Payly

Q Is this one of the things  
you've left out of your survey that may be important?

A Well, the situation is  
that the government can do -- can afford to do a certain  
amount of work in this regard. The companies are  
required to provide a certain level of information if  
they want to develop any other source. The level of  
information that we ultimately receive will be the --  
to the same level that we would carry out ourselves.

Q Well, if a given operation  
is far away from some of the big deposits that you have  
analyzed through your survey, you must then with the  
method that you have chosen to employ, leave it to the  
company to assess which of the deposits in their own  
area they should select. You rely on their information?

A That's true at the  
moment, yes.

Q Now, on page 15 of your  
evidence, to 33 sites which were rejected for geotechnical  
or environmental regions. Can you tell me whether the  
Campell Hills I.B.P. site was one of these, proposed  
I.B.P. sites.

A I'm not certain whether  
that particular site was rejected by the consultant or  
not. I suspect it may have been. I can check that.

Q Could you? Perhaps you  
can supply us that information through your counsel.  
Can you tell me whether the Caribou Hills proposed I.B.P.  
site was rejected by the consultant?

A Yes, it was.



Inglis, Speller  
Cross-Exam by Bayly

1 Q Can you tell me whether  
2 the granular beaches along the coast or any of them  
3 were rejected?

4 A Some were, yes.

5 Q Can you supply that informa-  
6 tion about those beaches or barriers or spits that were  
7 rejected through your counsel?

8 A Yes, I can provide you  
9 with that information this afternoon if you wish.

10 Q All right. Could you also  
11 provide us with the information of those that were found  
12 acceptable, that fitted into the category of beach,  
13 barrier or spit?

14 A Yes. If I may say that I --

15 MR. GOUDGE: Do you want them  
16 identified, Mr. Bayly, I don't quite understand what  
17 you're asking the witness.

18 MR. BAYLY: Yes, I'd like to  
19 know, first of all, was the report set up in such a way  
20 that the -- if a beach or a barrier were acceptable, it  
21 would be designated as such and named?

22 THE COMMISSIONER: It would be  
23 on the map.

24 A Yes, all sources  
25 that were surveyed, were identified on the maps. The  
26 consultant suggested that certain, or 33 sites not be  
27 developed on his -- that was his personal view. I might  
28 say that I put very little reliance in the environmental  
29 information provided by this particular consultant and  
30 the approach that's been adopted in subsequent programs





Inglis, Speller  
Cross-Exam by Bayly

1 has been that the department has carried out their own  
2 environmental assessment of particular sites. I wouldn't  
3 put too much weight in what the consultants are saying.  
4 It seems to me that it -- this is my person view-that if  
5 you employ a geotechnical consultant you get geotechnical  
6 data and his environmental views may or may  
7 not be of much use to you. In this case, I find them  
8 somewhat useless.

9 THE COMMISSIONER: Well, just  
10 so we don't spend anymore time on this, there's no reason  
11 is there, why that consultant's report shouldn't be made  
12 available to Mr. Bayly is there?

13 MR. GOUDGE: Well,  
14 sir I can certainly inquire. I would think not.

15 THE COMMISSIONER: That would  
16 simplify it and you can just look at it.

17 MR. BAYLY: Well, that might  
18 short circuit this cross-examination, sir, and perhaps  
19 if I had any questions, I could direct them through Mr.  
20 Goudge to Dr. Inglis.

21 MR. MARSHALL: I think that  
22 granular materials inventory report's been available  
23 for a year.

24 A That's correct, yes.

25 MR. MARSHALL: Well, if that's  
26 the report it's been --

27 THE COMMISSIONER: That consulta-  
28 nt -- the consultant's report is the granular material  
29 survey that has come up a number of times.

30 A Klohn Leonoff's work is



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Cross-Exam by Bayly

1 part of it, sir. There were other consultants involved  
2 in other areas.

3 THE COMMISSIONER: Well, would  
4 you sort that out, Mr. Goudge?

5 MR. GOUDGE: Yes, I can sort  
6 that out, sir, and I'm sure -- I would think in all  
7 likelihood the report can be made available to  
8 Mr. Bayly and that may satisfy him.

9 THE COMMISSIONER: You're saying,  
10 though, that "don't put too much stock in the report  
11 because these exclusions certainly upon environmental  
12 grounds, might not be acceptable to the department and  
13 others that were not excluded might well be excluded by  
14 the department?"

15 A Yes, that's  
16 the case.

17 MR. GIBBS: Only with respect  
18 to the environment, you said not to put too much weight.

19 MR. GOUDGE: The environmental  
20 opinions, I took him to say.

21 THE COMMISSIONER: Geotechnical,  
22 then presumably their opinions carry weight.

23 A Oh yes, certainly. The --  
24 although we may have reservations about particular sites  
25 that they have looked at and recommended. As far as the  
26 environmental side, my view is that if you ask a  
27 consultant to write a paragraph on environmental concerns,  
28 he'd be only too delighted to because it's a good source  
29 of income, whether the opinion is of any weight or not,  
30 that's -- so, what I'm suggesting is that I wouldn't get



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Cross-Exam by Bayly

too hung-up on the 33 sites that have been excluded.

We may have 50 or 60 sites that we want developed. This will emerge in the management plan that the department is currently involved in producing.

MR. BAYLY: Let's go into some of the things the department may thing and I refer you to page 23 of your evidence in the first full paragraph where you talk about the possibilty of taking gravel from the eroding offshore islands, such as Garry Island, and my understanding is that some gravel has already been removed from Garry Island by the Imperial Oil Limited Company and that the Canadian Wildlife Service, according to Dr. Barry, opposed this and at one point, this removal was stopped. Are you aware of that?

A Yes, I am.

O But you're recommending here in your evidence that perhaps Garry Island might be a suitable source for gravel.

A But there's -- Well, it's important to mention that I'm talking about the eroding part of Garry Island, not the part which is currently building up, that is the spit area. In discussing this with Dr. Ross McKay this past summer, we were discussing the problems of obtaining gravel for offshore development. He suggested that as some parts of the coast of Garry Island on the windward side were actively eroding and that to remove gravel from these coastal bluffs, I think up in the -- I can't remember whether it's the -- well, at least on the northwest side, would merely be hastening an active geomorphic process.





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Cross-Exam by Bayly

1 To remove material from the spit would be doing something  
2 completely different and that wasn't what we was suggest-  
3 ing. It's something that I'm suggesting should be looked  
4 into. That doesn't imply approval or disapproval of it.

5 Q Perhaps this is a simple  
6 minded approach to it, but if you take away the part  
7 that's already eroding, don't you expose on the windward  
8 side, areas that wouldn't erode for some time?

9 A This may be true. This  
10 was -- this is a possible source of gravel in addition  
11 to those already identified. We would obviously have  
12 to look into the entire impact of such a development.

13 Q So this is a suggestion  
14 thrown out rather than a recommendation.

15 A It's a suggestion that  
16 was made to answer the question regarding possible  
17 sources of material. It doesn't imply approval or dis-  
18 approval of that on the part of the department. It's  
19 an option that may be available.

20 Q Well, who do you put these  
21 suggestions out to? Do you suggest to the oil companies  
22 that they might use that as a source of gravel and then  
23 expect to a land use permit -- a land use application?

24 A Well, they might employ a  
25 consultant to go out and to conduct an environmental  
26 impact assessment.

27 Q I'm not looking for a joke,  
28 Dr. Inglis.

29 A An environmental consultant.

30 Q Will you be gettin a hold



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Cross-Examination by Bayly

1 of the Canadian Wildlife Service consultant, or no  
2 consultant about this.

3 A Pardon?

4 Q You'd be contacting the  
5 Canadian Wildlife Service whether or not you hired a  
6 consultant to see what their concerns might be about  
7 Garry Island?

8 A Oh, obviously with a  
9 project such as that, the impact would have to be con-  
10 sidered very carefully indeed and -- I mean that would  
11 certainly be an obvious step to take.

12 Q I suppose the same thing  
13 would apply to T-106 which is one that we don't know  
14 so well, but that's another one that you've just suggested  
15 without having done the assessment, I take it. Is that  
16 correct?

17 A T-106 is in current use  
18 by the Tuk community. It's a small <sup>island</sup> in the harbour and  
19 they are actively exploiting that source now.

20 Q So I assume that's already  
21 been done, has it?

22 A An impact assessment?

23 Q Yes.

24 Well, this source has been  
25 in use for quite some years. I don't know what the  
26 status of that was.

27 Q So, it came into use  
28 before impact assessments became fashionable?

29 A Yes, that's correct.

30 Q On page 28 of your evidence,



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Cross-Exam by Bayly

1 at the bottom of the first paragraph, you say that it  
2 may be expedient to open a small quarry near a remote  
3 facility where only limited quantities of material are  
4 required. What do you mean by "expedient" that it  
5 would be less expensive, or --

6 A Well, there are a number  
7 of factors which obviously come into play. It depends  
8 where the facility is located, what alternatives are  
9 available at what time of the year the work has to be  
10 done; the quantities of material that have to be removed.  
11 The environmental implications of either opening a small  
12 quarry or withdrawing material from a larger one --

13 perhaps there are other conflicting demands. The  
14 quality of the material that's required -- all these  
15 things would have to be taken into consideration, but  
16 it would seem reasonable that, for example, in the Tuk  
17 Peninsula area if an<sup>oil</sup> company required 20,000 yards of  
18 gravel to build a drilling pad and that such material  
19 was available without creating any major impact on the  
20 site and that such was in conformance with the management  
21 plan of the department then<sup>it</sup> may be that that source would  
22 be opened rather than hauling material across a winter  
23 road from Yaya Lakes, which occasionally happens at the  
24 present time.

25 Q This is the tentative plan,  
26 I take it, of Gulf Oil in the Parsons Lake area. They  
27 talk about using a number of local deposits, rather than  
28 going to one of the large sources that have been looked  
29 at by both the government and it's consultants.

30 A That's correct and two



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Cross-Exam by Bayly

1 sources of material are presently being used in the  
2 Parsons area to supply the requirements of field delineation  
3 at the present time.

4 Q This would be one of the  
5 assessments that would be beneath your gaze and you  
6 would leave to the company to do, is that correct?

7 A The assessment of the  
8 quality and quantity of material available in the Parsons  
9 Lake area?

10 Q Yes.

11 A Gulf Oil have already  
12 provided a very detailed evaluation of the -- of sub-  
13 deposits in the Parsons Lake area.

14 Q Do they provide the environmental assessment too, or is that something that  
15 the government does?

16 A In this case, the consultant  
17 provided merely drill hole logs and other information --  
18 geotechnical information. They didn't provide any  
19 environmental assessment of this source.

20 Q Now, if I can turn you  
21 to page 29 of your evidence, you state that there is a  
22 geotechnical evaluation of three sources which has  
23 been done, and it estimates that there are 36 million  
24 cubic yards in them. You go on to say that if this  
25 site is eventually developed, it can be done in such  
26 a way that the natural features and the aesthetic appearance  
27 of the area are not affected. Now, Mr. Scott  
28 spent quite a long time cross-examining gravel experts  
29 and determined that when you take out a large amount of  
30





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Cross-Exam by Bayly

1 gravel, you leave a large hole. What I'm concerned  
2 about is if you have any suggestions of ways that this  
3 hole can be dealt with, as you seem to in this, that you  
4 might share those with us.

5 A Well, this particular site  
6 has been the subject of intensive investigation by the  
7 department and also the members of the I.B.P. panel  
8 who have a vested interest in this particular site. We  
9 inspected the -- I say "we" -- myself and a representative  
10 from I.B.P. inspected this site last summer on two  
11 occasions for several days and looked at the area very  
12 closely to determine what features of the site were  
13 important to the I.B.P. program in it's buffer zone in  
14 which this particular site falls. We've decided before  
15 we did allow any drilling in this area that certain gravel  
16 extraction could proceed without jeopardizing the area  
17 as part of the I.B.P. reserve.

18 Q But you're not suggesting  
19 that we wouldn't notice it if 36 million cubic yards  
20 were taken out of there?

21 A There's not 36 million  
22 cubic yards on that site. That's the total possible --  
23 potentially available material from three sources. That  
24 particular site has been estimated to contain 20 million  
25 yards of sand and gravel. Our preliminary results for  
26 our drilling/<sup>program</sup>last week indicated that there may be 15  
27 million yards in total. Now, whether that --

28 BESPALL I'm sorry,  
29 how many?

30 A 15 million yards of an



Inglis, Speller  
Cross-Exam by Bayly

1 estimated potential of 20 million, but of course these  
2 are very preliminary figures, the data haven't beer--

3 MR. BAYLY: Well, Dr. Inglis,  
4 if you take 15 million cubic yards out, how big a hole  
do you make?

5 A Well, this very much depends  
6 on where the material is and where is the -- obviously  
7 we have to look at the -- it's quite a large site. You  
8 have to look at where the material is available and we  
9 have a planner who is employed to project how the  
10 material can be removed to the satisfaction of I.B.P.  
11 and to the government.

12 Q Well, what does it do,  
13 does it create a new lake or do you remove a hill or --

14 A Well this is a -- this  
15 the  
16 particular sources is in/form of a large ridge and it's  
17 possible we may be able to remove material from the side  
18 of the hill.

19 Q From the side of the hill?

20 A That's possible. It's  
21 speculation since I haven't seen the results of the test  
22 program.

23 Q So, from the other side  
24 it might be unaffected?

25 A Well, the intent was that  
26 -- when I talk about aesthetic appearances, the aesthetics  
27 enter into it from the part of people travelling down  
28 the river, and, to my mind and to those of many people  
29 that have been involved with the I.B.P. site, the most  
30 interesting feature of the site is the west facing scar



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Cross-Exam by Bayly

1 and the relic stands of white spruce which occur on the  
2 west side of this particular source. Now if we develop  
3 the east side of the source in a stream valley, then the  
4 results would not be visible from the river, although  
5 they certainly would be from the air or from anyone  
6 travelling for some reason who's deliberately going to  
7 the quarry site. But the principal feature of that site  
8 of interest to I.B.P. was the relic features of white  
9 spruce and some others.

10 Q So, what you're saying is  
11 you wouldn't see it from the river and it would protect  
12 this stand of white spruce which the I.B.P. site people  
13 think is particularly important?

14 A That's amongst other  
15 features and any management plan would have to be done  
16 in consultation with I.B.P. This is, in fact, being  
17 done at the moment.

18 THE COMMISSIONER: At any rate,  
19 if it were felt necessary to develop this site, that is,  
20 the way in which it could be developed with some measure  
21 of consistency with I.B.P.'s objectives. That's the  
22 size of it, is it?

23 A That's right, yes.

24 MR. BAYLY: Now, on page 30,  
25 you talk about it being possible with careful management  
26 to meet the various demands on granular resources, you're  
27 referring particularly, I think, to the area near Parsons  
28 Lake, but when you say "careful management" are you  
29 projecting needs over a ten year period, a twenty year  
30 period, fifty years, a hundred years -- how do you scale





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Cross-Exam by Bayly

1 that?

2 A Well, this is one of the  
3 problems that the department is faced with at the  
4 moment. It's obvious from what I've said earlier that  
5 we are not aware of all the gravel requirements in the  
6 delta area. It's obvious that certain priorities  
7 have to be established. Obviously, one of the priorities  
8 is that the granular requirements for the communities  
9 be met.

10 Q Well that doesn't solve  
11 the problem, though, does it because it still doesn't  
12 tell me whether they'll be met for the next 20 years  
13 or the next 100 years?

14 A Well, it's -- at the  
15 present time, with the figures changing weekly --

16 THE COMMISSIONER: You mean  
17 the figures of gravel deposits?

18 A The demand requirements --

19 THE COMMISSIONER: Oh, right,  
20 right, right, right, right.

21 A --<sup>are</sup>/changing daily and  
22 it's impossible to say whether<sup>every</sup>/development in that area  
23 can be met as -- from the figures I have at the moment, for  
24 the requirements for Inuvik, the requirements of the  
25 gas going system as proposed by the producers, the re-  
26 quirements for the Inuvik-Tuk Highway I feel that  
27 those projects, in the terms of which I have described  
28 them, the gravel requirements could be satisfied.

29 Q How do you find out what  
30 the gravel requirements<sup>are</sup>/for a community? Do you go and



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Cross-Exam by Bayly

ask them?

A Well, this is what the Government in the Northwest Territories has been doing. This is the figures that they've produced.

O Well, do they ask them what gravel they need for ten years, or what gravel they need for fifty years?

MR. MARSHALL: He can't answer a question like that sir, it's -- they get information from the Government of the Northwest Territories and he's not here as a representative of that government.

MR. BAYLY: I'm not suggesting that he is, sir, but he is here to tell us about forecasts and proper management and if he knows whether all the communities give the forecast for the same number of years, that will tell us something about the value of those estimates.

THE COMMISSIONER: Well, make a comment, if you wish, sir.

A Well, the report prepared by Makale and Holloway and Associates covers the forecast demand for a number of years. I don't know the figure, but it is at least ten years, I believe possibly more. But the great difficulty is that it's almost impossible to separate the gravel requirements for a community in this area and that required for development since the two are inextricable. They go hand in hand, in other words. So that Inuvik is only asking for three million yards for itself because it knows it has to satisfy a possible population of six or ten thousand



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Cross-Exam by Bayly

1 people and that there will be if this development proceeds.  
2 So, it's very difficult to -- as more development is  
3 proposed, then the community will presumably up their  
4 requirements to provide for roads and upgrading airstrips  
5 and so forth.

6 Q Well, this makes your job  
7 very difficult, Dr. Inglis, I take it, to make sure you  
8 set aside enough granular materials for the various  
9 competing uses. Is that fair to say?

10 A That's right and I think  
11 that what it comes back to is that perhaps a regional  
12 plan is required before the ceilings can be placed on  
13 some of these figures. Obviously if someone -- if the  
14 Government in the Northwest Territories or the Department  
15 of Indian Affairs and Northern Development is prepared  
16 to turn around and say that, "all right, Inuvik shall  
17 serve only a population of 6,000 people," then we can  
18 very quickly come up with a figure for the gravel demands  
19 for this community. If -- but until such figures are  
20 produced and I think Mayor Robertson made one or two  
21 suggestions last night about what this, the ultimate  
22 population of this town might be. Until such a figure  
23 is actually confirmed in the regional plan, then it  
24 would be very difficult to make much headway on this  
25 issue.

26 A But you're not even dealing  
27 with the same number of years, I suggest to you, for  
28 the communities and the -- say the applicants for the  
29 gas plant. Shell, for example has given you figures  
30 projected over a twenty year period.



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very poor information on requirements, as I've said before.

You'd want to have figures that were consistent forecast to you, over a number of years, in any event. You'd want to make sure that you were dealing with forecasts for the same period of years for the competing firms?

Yes, in that situation, yes.

It is really impossible to do your task without that.

It is impossible, now, to find out what is going to happen because the government is in the position of managing resources. We can't possibly tell what -- I don't think we'll ever be in the position to tell what development has been forecast, what changes are going to be made at any given project at any given time. If someone decides in two years time to build a railroad through here, then the whole picture changes drastically. We can't wait until everyone has come in with absolute final design information <sup>because</sup> I don't think that material will ever be available.

Q So what you're asked to do then, is to react to developments and requirements as they are given to you, rather than to say there is this much there, and therefore, a certain number of things can take place using these resources?

A Well, we can certainly forecast what the demand may be and I think these are --





Inglis, Speller  
Cross-Exam by Bayly

1 the figures I've cited here are forecasts over various  
2 periods of time, depending on the information that we  
3 have at the moment. Yes, we have to try and accommodate  
4 these demands in some form of management plan. We can't  
5 wait until every potential developer has produced his  
6 ultimate final design.

7 Q It's not just you that  
8 reacts to them, the resource itself, which is fixed has  
9 to be meted out to the various potential users. The fact  
10 that somebody may decide to build a railway, for example,  
11 may not be a decision that they can make if you've already  
12 parceled out in your plans the granular resources that  
13 are available here, unless they're willing to bring it  
14 in from somewhere else.

15 A That's right.

16 Q One more question on the  
17 Shell application. We heard from Messrs. Faulkner and  
18 Serra of the Shell Company in the transcript at pages  
19 17,336 to 17400 and at 17430, a discussion of, first  
20 of all, the total gravel at the Yaya esker which they  
21 estimated at nine million cubic yards, and would you  
22 agree with that figure?

23 A Yes, I would.

24 Q Messrs. Faulkner and Serra  
25 said that Shell's projected requirements were 800 thousand  
26 cubic yards plus 50 thousand cubic yards per year for  
27 twenty years for maintenance. Now, is it within your  
28 expertise to comment on that amount of granular material  
29 for maintenance in that particular application or not?

30 A As far as I'm aware



Inglis, Speller  
Cross-Exam by Bayly

1 there has been so little of that information provided  
2 that it would be entirely impossible to predict whether  
3 such quantities would be realistic or not.

4 Q Now, you don't then have  
5 a formula for determining if so many cubic yards of gravel  
6 are required that the maintenance requirement to keep  
7 up the facilities will be a percentage of that per year?

8 A No. No, I don't and there's  
9 so many other factors entering into it this would be  
10 very difficult to do because --

11 Q That depends whether it's  
12 a pad or a road or --

13 A Yes, it's impossible to  
14 say. If it's built to -- with poor materials to relative-  
15 ly low standard, then maintenance requirements would be  
16 high. If you used high grade materials and do a good  
17 job initially, then maintenance requirements will be low.

18 Q Given that you had all  
19 those facts that you knew what the gravel was required  
20 for and therefore the use of the facility that was using  
21 it and you knew the kind of material and the amount of  
22 traffic or use that the facility was going to get, could  
23 you work out the maintenance requirement for a project  
24 like that on a per year basis?

25 A I think if we had all the  
26 information at our disposal, we could make a reasonable  
27 estimate of demand , yes.

28 Q Well, those are things,  
29 I suggest to you, that you have to do if you're planning  
30 for the intelligent use of this resource because you



Inglis, Speller  
Cross-Exam by Bayly  
Cross-Exam by Marshall

1 not only need to know how much is required for a facility  
2 but how much is required to maintain it over it's projec-  
3 ted life. Would you agree with me there?

4 A Yes.

5 Q You aren't in a position  
6 to know that yet?

7 A No.

8 MR. BAYLY: Those are all the  
9 questions I have, thank you.

10 MR. MARSHALL: Dr. Speller, I  
11 have no questions for you.

12 CROSS-EXAMINATION BY MR. MARSHALL:

13 Q Mr. Inglis, I have a few  
14 questions for you. I see from your C.V. that you are  
15 the land -- you're a land management biologist and acting  
16 head of Land Management Section, Water, Forest, Lands  
17 and Environment Division, D.I.A.N.D., Ottawa. I wonder  
18 if you could tell us what that means? What are your  
19 responsibilities.

20 A My responsibilities as a  
21 Land Management Biologist or as Acting Head of the Land  
22 Management Section?

23 Q What does it do? Does it  
24 control -- what I'm getting to is this. Is that the  
25 agency that's responsible for the allocation of borrow  
26 resources in the Northwest Territories?

27 A The -- that section has an  
28 input into the preparation of a granular material manage-  
29 ment plan for the gravel resources of the Northwest  
30 Territories.





Inglis, Speller  
Cross-Exam by Marshall

1 Q Such a plan, then, is  
2 administered and run by the Department of Indian and  
3 Northern Affairs?

4 A That's right.

5 Q It has the jurisdiction  
6 over the use to <sup>be</sup> made of granular materials in the North-  
7 west Territories?

8 A That's correct.

9 Q It has the right to  
10 allocate between competing uses if there be any for  
11 materials in a given area?

12 A Yes.

13 Q Is there presently an  
14 administration set up that handles that? Do you handle  
15 that or is there another agency within D.I.A.N.D. which  
16 handles that?

17 A Well, it depends on the  
18 level of what type of project is being considered. What  
19 happens, in fact, is that quarrying applications are  
20 made to the head of the Land Use Section or the engineer  
21 in Yellowknife for quantities of granular material or  
22 rock. The proponent provides an estimate of his material  
23 requirements. He pays a fee with his application for  
24 the material. If a quarry permit is issued, if  
25 the department considers that a quarrying permit should be  
26 issued, it's issued and attached to a land use permit  
27 with it's attendant environmental stipulations.

28 Q I was just wondering  
29 specifically where you fit in in the permit issuing  
30 authority. Do you issue the permits or do you make



Inglis, Speller  
Cross-Exam by Marshall

1 recommendations to the person that does?

2 A We may make recommendations  
3 for -- on applications. The permits are issued in  
4 Yellowknife in the Northwest Territories.

5 Q I see. I see you're a  
6 biologist. Is your particular area then, biological or  
7 environmental consideration, related to removal of borrow  
8 resources?

9 A Well, as land management  
10 biologist, it related mainly to the environmental side  
11 As acting head, it covers the spectrum of activities  
12 related to the resource management.

13 Q I guess the point is this.  
14 This isn't an activity that's regarded strictly as an  
15 engineering matter. This is one that within D.I.A.N.D.  
16 involves both engineering and environmental or biological  
17 considerations.

18 A That may be the case, yes.

19 Q Well, I see you have a  
20 B.Sc. in zoology and and M.Sc. in biology with distinc-  
21 tion, presumably you bring that type of input into these  
22 considerations, do you not?

23 A Amongst others, yes.

24 Q Sir, being a biologist,  
25 I take it, and I think you've stated this in answer to  
26 some of my learned friend's questioning that the estimates  
27 given in your evidence really are not your own assessment.  
28 You don't have the qualifications personally, yourself,  
29 to make assessments of quantities of borrow in a par-  
30 ticular deposit. That's not your subject area.



Inglis, Speller  
Cross-Exam by Marshall

1                   A     I'm not required to  
2 estimate material in particular sources, no.

3                   Q     You would be aware, though,  
4 would you, sir, that without sampling and drilling, borrow  
5 estimates do lack precision and there's not really  
6 necessarily any agreement between experts as to what  
7 the quantity of borrow reserves might be in an area,  
8 without such an extensive sampling program?

9                   A     I agree with that, yes.

10                  Q     Sir, I was wondering if  
11 in the consideration of the available reports and studies  
12 in the preparation of your evidence, you had regard to  
13 a report that is in as Exhibit 437 in the proceedings of  
14 this Inquiry. It a report of J. D. Mollard and Associates  
15 Limited entitled, "Gravel Inventory Survey, Richards  
16 Island and Adjacent Areas", dated October, 1972.

17                  A     I'm familiar with that, yes.

18                  Q     You are.

19                  A     Yes.

20                  Q     Just a couple of points I  
21 want to refer to in the report and get your comments on  
22 them. At page 17, it set out that there were 131 pros-  
23 pects identified and at page 18 under item six -- under  
24 item five, Dr. Mollard says:

25                  "Altogether, an estimated nearly 2 billion cubic  
26 yards of stratified graded sand and gravel deposits were  
27 mapped in the 13 best deposits."

28 I take it, sir, you've looked through the report and you're  
29 familiar with this identification that Dr. Mollard refers  
30 to in this report?





Inglis, Speller  
Cross-Exam by Marshall

1 A Yes.

2 Q In item seven, on page 18,  
3 which is part of his summary, he states:

4 "The three most promising looking areas are as  
5 follows: (a) several ice context sand and gravel  
6 deposits bordering the shores of Yaya Lake."

7 That, just stopping there sir, that would be the some  
8 nine million cubic yards that was referred to, I take it?

9 A That's correct.

10 Q That's been the subject  
11 of a more detailed study by A.P.O.A.?

12 A That's right.

13 Q Yes. And then:

14 "(b) outwashed deposits bordering the left and  
15 right banks of the East Channel east of Tununuk".

16 Are you familiar with that area, sir, and its borrow  
17 reserves?

18 A Those were the areas that  
19 Indian Affairs drilled last month.

20 Q I'm sorry, that we drilled--

21 A Those were the areas that  
22 -- where the D.I.A.N.D. and geotechnical program was  
23 conducted in January and early February of this year.

24 Q What are your estimates  
25 of the granular material reserves that are located in  
26 that general Tununuk area?

27 A I think I've stated those  
28 in my testimony. I don't have the figures off the top  
29 of my head.

30 Q I note in Dr. Mollard's





Inglis, Speller  
Cross-Exam by Marshall

1 report that I've been quoting to you from, he's got one  
2 area here identified as "prospect number 11" between  
3 Tununuk and Reindeer Depot one mile inland off the East  
4 Channel, estimated probable minimum cubic yards in  
5 prospect, twenty-five million. Would that be one of the  
6 ones that you'd<sup>have</sup>/looked at, sir?

7 A I believe that's -- I may  
8 be wrong -- but I suspect that site is located within  
9 the I.B.P. biological reserve that has been proposed and  
10 therefore, falls into a site that the department is not  
11 currently investigating.

12 Q I'll want to get into that  
13 with you a little bit later. I gather there is some  
14 deposits near Tununuk that are within a proposed I.B.P.  
15 site and some that are without.

16 A That's right.

17 Q Now sir, under item seven,  
18 continuing/<sup>item</sup>C under it, this is a consideration by Dr.  
19 Mollard of the three most promising looking areas. (c)  
20 is:

21 The west facing escarpment of the Caribou Hills  
22 between latitude 68 degrees, 44 minutes to 68  
23 degrees, 51 minutes."

24 You're familiar with that area as well, sir?

25 A Yes, I am.

26 Q I gather that seven  
27 minutes is seven nautical miles, is it?

28 A Could you repeat the ques-  
29 tion?

30 Q Seven minutes of latitude



Inglis, Speller  
Cross-Exam by Marshall

1 is about -- is seven nautical miles? That's the size  
2 of the site that we're talking about here -- that Dr.  
3 Mollard's talking about here. 68 degrees, 44 minutes,  
4 to 68 degrees, 51 minutes.

5 A Oh, I assume that's -- yes,  
6 presumably those coordinates cover the area.

7 Q Yes, it's quite a large  
8 area. It's seven nautical miles.

9 A Yes, O.K., I agree with  
10 that.

11 Q Now, I don't recall any specific  
12 reference in the report, sir, but evidence has been  
13 given before this Inquiry by witnesses for the producers  
14 that approximately 90 percent of the two billion cubic  
15 yards of reserves found by Dr. Mollard or estimated by  
16 him were in the Caribou Hills area. Does that correspond  
17 with your knowledge?

18 A I don't know for the  
19 percentage figure, but certainly it would be a significant  
20 proportion of all the available -- of all the potential  
21 material in the areas.

22 Q There's one prospect that  
23 Dr. Mollard looked at in the Caribou Hills and I'll just  
24 ask you whether or not you're familiar with it and agree  
25 with his estimates. He's identified it as prospect  
26 number 12, East Bank of East Channel, north of Reindeer  
27 Depot in Caribou Hills. Estimated probable minimum  
28 cubic yards in prospect, 120 million. Are you familiar  
29 with that area, sir?

30 A I'm familiar with the area.



Inglis, Speller  
Cross-Exam by Marshall

1 Are you asking if I agree with his estimate?

2 Q Yes.

3 A Well, Ripley, Klohn and  
4 Leonoff have an estimate for that particular deposit,  
5 if we're referring to the same one which I can't tell  
6 without looking at your maps and photographs, but  
7 assuming that it is, then Ripley Klohn and Leonoff have  
8 a somewhat lower figure. On the other hand, this site  
9 has never been investigated in any detail. There have  
10 been a few hand dug test pits there. As far as I know,  
11 Mollard didn't do any work in there. Ripley, Klohn  
12 and Leonoff didn't do anything other than a very broad  
13 reconnaissance operation because we were not in the  
14 position of issuing land use permits for that area to  
15 conduct such surveys.

16 Q I haven't the coordinates  
17 on the page in front of me, so I'm not able to check  
18 that. What estimate have Klohn and Leonoff given for  
19 reserves in the area that you've been referring to?

20 A The major sources on the  
21 west facing scarp of the Caribou Hills within the core  
22 area of the I.B.P. reserve would be numbers 323-A and  
23 324-A. Within 323-A, Ripley, Klohn and Leonoff estimate  
24 15 million yards and 324-A, they estimate ten million  
25 yards. The "A" designation signifies that Ripley,  
26 Klohn and Leonoff consider that these two sites should  
27 not be developed with respect to their position in the  
28 I.B.P. site.

29 Q Proposed I.B.P. site?

30 A Proposed I.B.P. site.





Inglis, Speller  
Cross-Exam by Marshall

Q Now sir, I was wondering if you could comment on this proposition. It's clear that there are very substantial reserves of granular materials that have been identified by Dr. Mollard and others in the area of the delta, Richards Island, Parsons Lake. Dr. Mollard gives a figure of 2 billion cubic yards. It's also clear that a very substantial portion of those reserves are found in various parts of the Caribou Hills. There's been evidence that a stretch -- I believe it's about 40 miles long in the Caribou Hills is being proposed as an I.B.P. site. Is that correct? Am I correct to this point?

A Except that I can't support Dr. Mollard's figures for the total quantities either in the delta or in hills based on his report.

Q Have you got a figure of your own?

A I don't have my own figure other than those that Ripley, Klohn and Leonoff propose. The Ripley, Klohn and Leonoff work was done quite some time later than Mollard's work and Mollard was a consultant to Ripley, Klohn and Leonoff in at least part of this job, so I can't believe that Ripley, Klohn and Leonoff would propose such conservative figures for available material if, in fact, three years or two years previously, Mollard had come out with a standing 2 billion cubic yards for the delta area.

Q Well, that's perhaps something that we could get some more direct information on, rather than your speculation. What sort of figures



Inglin, Steller  
Cross-Exam by Marshall

1 are proposed by Ripley, Klohn and Leonoff then, in this  
2 general area?

3 A I think --

4 Q I'm not talking about the  
5 areas that they recommended, I'm talking the areas they  
6 identified, including those<sup>in</sup> areas that they thought for  
7 geotechnical or environment reasons ought to be avoided.

8 A I believe I cited a figure  
9 of, well -- I'll check -- in my testimony. Page 26,  
10 I note that in the Richards Island, Caribou Hills area,  
11 this excludes Parsons Lake and the area adjacent to  
12 Parsons Lake. In the Richards Island, Caribou Hills  
13 area, the consultant has evaluated a large number of  
14 potential sources, which, together have been estimated  
15 to contain 80 million cubic yards of sand and gravel.

16 Q Do you know whether that  
17 figure includes areas that they thought ought to be  
18 avoided for geotechnical or environmental reasons?

19 A Yes, it does. These  
20 figures can easily be derived by just going down through  
21 the -- all the columns in the Ripley, Klohn and Leonoff  
22 report. It's a simple tabulation. I think that's, for  
23 this particular area, it's a reasonable figure. I'd  
24 have to go through Mollard's report and evaluate his  
25 sources in the same area to provide a valid comparison.

26 Q What I'm interested in, sir,  
27 is whether or not you, as a biologist, think that there  
28 are biological or environmental reasons that make it  
29 mandatory to set aside a very large I.B.P. site, which  
30 is the site of a large portion of the granular materials



Ngilis, Steller  
Cross-Exam by Marshall

1 that are found in the delta area, are there biological  
2 reasons that make it imperative to do so.

3 A Apparently I.B.P. -- the  
4 I.B.P. panel responsible for that -- the I.B.P.  
5 panel responsible for nominating the Caribou Hills --

6 THE COMMISSIONER: Yes, we  
7 heard from them. I think Mr. Marshall's just asking you for  
8 your opinion.

9 MR. MARSHALL: Whether you, as  
10 a biologist think that there are biological or environ-  
11 mental reasons that make it mandatory to avoid this  
12 area? We've heard from the I.B.P. people and I think  
13 Dr. Bliss had some comments on this area as well.

14 A I haven't reviewed their  
15 proposal in sufficient detail to say categorically  
16 whether that particular -- the entire site was necessary  
17 to achieve the ends of I.B.P. or not.

18 Q Sir, you mentioned that  
19 your department had environmental assessments of borrow  
20 sites that were identified by the consultants Ripley,  
21 Klohn, Leonoff, or did I misunderstand you?

22 A Do you mean did I say  
23 that Ripley, Klohn and Leonoff had some environmental  
24 statements on each site?

25 Q Well, you said that and  
26 you gave us your views as to what weight should be  
27 attached to them. I took it from from your remarks  
28 that your department had, itself, done environmental  
29 assessment of these sites.

30 A We do environmental assess-





Inglis, Speller  
Cross-Exam by Marshall

1 ments as required on these sites. We don't have a  
2 large body of information on the sites at present, no.

3 Q I see. Your assessment  
4 awaits an application, does it, to develop a particular  
5 site?

6 A We've - we're in the pro-  
7 cess of assessing a number of sites but we haven't  
8 covered all of the sites that identify the Ripley, Klohn  
9 and Leonoff -- those that we have -- it's possible that  
10 those sites that were drilled this winter in the Tununuk  
11 area, East Channel area, may be developed with  
12 a minimum of environmental impact.

13 Q I was just wondering  
14 whether you had an overall environmental assessment of  
15 all of the sites that have been identified.

16 A This hasn't been completed  
17 yet.

18 Q Is this a project that's  
19 underway?

20 A Yes, it is.

21 Q When is it expected that  
22 that's going to be ready?

23 A I think it's an ongoing  
24 program. We'll -- obviously, we have very little  
25 information at the moment. We have information on four  
26 or five sites in the delta. As we expand our informa-  
27 tion then presumably we'll just add to this.

28 MR. MARSHALL: Thank you, those  
29 are all the questions I have.

30 MR. GOUDGE: No questions, sir.





Inglis, Speller  
Cross-Exam by Marshall

1 THE COMMISSIONER: Thank you  
2 very much Dr. Speller for your discussion on the impact  
3 of cumulative developments on wildlife in the delta, and  
4 thank you Mr. Inglis for your discussion of granular  
5 materials. Both of you were very helpful to us and  
6 we certainly appreciate your cooperation. We will ad-  
7 journ, then and the formal hearings will resume March  
8 15 at -- Monday, March 15 at 1:00 o'clock in Yellowknife.  
(WITNESSES ASIDE)

9 MR. BAYLY: Sir, perhaps we  
10 could meet to find out just what we're going to start  
11 with.

12 THE COMMISSIONER: Well, I  
13 was just going before you meet that I would -- that we  
14 have had a very useful examination of the delta and  
15 it's environment and the problems of the establishment  
16 of an energy corridor in the context of the other develop-  
17 ments that would occur. We've examined these problems  
18 and I take it the next stage is to listen to Arctic  
19 Gas's evidence regarding how they intend to cope with  
20 these problem in their cross-delta line. I understand  
21 they have a technical panel and an environmental panel.  
22 I suggest that counsel, in preparing for the continua-  
23 tion of the hearings in Yellowknife should bear in  
24 mind that all of you, with the exception of Commission  
25 counsel, presumably in some measure at least, consider  
26 yourselves adverse in interest to Arctic Gas, speaking  
27 generally for the purposes of developing a cross-  
28 examination.

29 I suggest that since Mr. Gibbs  
30 no doubt has a very great interest in the technical



1 panel, you might let him take the pulling oar with that  
2 panel and make sure that you don't all spend your own  
3 time and that of your advisers reviewing problems that  
4 others are examining.

5                               When you come to the environ-  
6 mental panel, I would appreciate it, Mr. Bayly and Mr.  
7 Evans, if you would coordinate your preparations so that  
8 you don't both seek to cover the same ground with the  
9 environmental panel. I think that's economical from the  
10 point of view of your own time and the expenditure of  
11 the effort of your own advisors. I think if we proceed  
12 in that way               we can achieve a great deal in a short  
13 time when we get to those two panels. I'm not urging  
14 them to gang up on you, Mr. Marshall, but I think that  
15 I just want them, if they do gang up on you, to do it in  
16 an organized way.

17                               Well, you have your meeting  
18 then and I'm right, am I not, in saying we're adjourned  
19 till March 15.

20                               MR. GOUDGE: Yes sir. The  
21 formal hearings would be adjourned until March 15th  
22 at 1:00 o'clock and I think counsel are -- all have the  
23 same understanding and we can perhaps confirm it in our  
24 meeting that we will begin then with the Arctic Gas  
25 technical panel on the cross-delta proposal.

26                               THE COMMISSIONER: I want it  
27 understood that when we get to Arctic Gas's technical  
28 panel, they're dealing with specific subjects and it  
29 won't be necessary and certainly, I don't think it will  
30 be necessary to discuss the problems in general terms



1 with the witnesses. I think specific matters of impact  
2 are what will concern us then. We've had a review of  
3 the whole delta situation. We've examined these problems.  
4 We understand them and now we want to know what Arctic  
5 Gas intends to do about them and I think your questions  
6 should be directed to the specific measures they propose  
7 to take.

8 After that, we'll be into  
9 Phase Four and moving right along.

10 MR. MARSHALL: Mr. Commissioner,  
11 I should mention that Mr. Goudge asked me if I could  
12 arrange for Dr. Clark and Dr. Cooper to be added to the  
13 technical panel as there were a number of areas we wanted  
14 to explore in cross-examination with them. I haven't  
15 discussed it very far with Mr. Goudge or any of the  
16 other counsel as to whether or not there is specific  
17 items that they want them to cover by way of direct  
18 evidence, and I take it, if there are such areas, they'll  
19 let me know and I could then perhaps have some pre-  
20 pared.

21 I expect they'll be available,  
22 I haven't spoken yet with either of them but I passed  
23 on word that Mr. Goudge wants them up here, so I'm sure  
24 that's all it's going to take.

25 THE COMMISSIONER: All right.  
26 What I'm getting at is I don't have to be taken through  
27 the whole course on frost heave again -- either in chief  
28 or in cross-examination. I don't have to be reminded  
29 again that there are birds nesting every summer in the  
30 Mackenzie Delta and so on and so forth. We can assume





1 that I will not have forgotten all of that in the next  
2 three weeks. So, we'll adjourn and thank you again  
3 gentlemen.

4  
5 (PROCEEDINGS ADJOURNED TO MARCH 15, 1976)  
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Canada.National Energy Board  
Mackenzie Valley Pipeline-  
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MACKENZIE VALLEY PIPELINE INQUIRY

Government  
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF  
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A  
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS  
CROWN LANDS WITHIN THE YUKON TERRITORY AND  
THE NORTHWEST TERRITORIES, and  
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY  
THAT MIGHT BE GRANTED ACROSS CROWN LANDS  
WITHIN THE NORTHWEST TERRITORIES  
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

March 16, 1976.

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PROCEEDINGS AT INQUIRY

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Vol. 130

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Mr. Garth Evans Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

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I N D E X

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WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

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Miss Gretchen V. MINNING	
Guy Leslie WILLIAMS	
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Russell Alexander HEMSTOCK	
- In Chief	19750
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EXHIBITS:

493	Letter from Canadian Arctic Gas to I. Scott re CAGPC plan refinements & maps dated March 8, 1976	19793
494	Appendix "A" to Hollingshead's evidence	19793
495	Revised Tables 1, 2 & 3, Borrow Requirements Figures 1, 2, 3, Borrow Deposits Mackenzie Delta	19793
496	Report by N.E.S., Pipeline related Borrow Studies, Cross-Delta Alternate Route and East of Fort Simpson Re-Alignment	19793



1 Yellowknife, N.W.T.

2 March 16, 1976.

3 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

4 THE COMMISSIONER: Well, ladies  
5 and gentlemen, are we ready to go? Mr. Marshall?

6 MR. MARSHALL: Sir, the  
7 surroundings look familiar and I've a suspicion that  
8 some of the people on the panel today have been here  
9 before. They tell me/<sup>it's</sup>about a year ago today that they made  
10 their first appearance before you, sir.

11 We are going to commence with  
12 the technical panel pertaining to cross-delta. Members  
13 of the panel are Mr. Williams, Mr. Purcell, Dr. Hollings-  
14 head and Miss Minning. All of them have been previously  
15 sworn, sir.

16 Mr. Goudge asked that I have  
17 Dr. Jack Clark and Dr. Dick Cooper available for cross-  
18 examination. They are here in the room and I'll add  
19 them to the panel once cross-examination gets under  
20 way.

21 Sir, the cross-delta technical  
22 evidence of this panel was circulated some weeks ago.  
23 Since then, Arctic Gas has made certain refinements to  
24 its plan. They have been set out in a letter from me  
25 to Mr. Scott and the participants, dated March 8, 1976.  
26 Sir, I would like to file a copy of that letter and the  
27 maps that are attached to it as exhibits, and I propose  
28 to read the letter into the record.

29 It's a letter to Mr. Scott  
30 from myself dated March 8, 1976, re CAGPL plan refinements.



1 "With respect to the plan for Canada north of  
2 60, Arctic Gas has considered possible modifi-  
3 cations to accommodate environmental and socio-  
4 economic concerns raised to date before the  
5 Inquiry. Changes in the Government of Canada's  
6 plans for highway construction, and changes  
7 to staging facilities in the Hay River area.  
8 My purpose in writing you is really to set out  
9 these changes so that you and the participants  
10 will have an opportunity to consider them in  
11 advance of Phase 4 of the Inquiry, heading  
12 (a) Environmental considerations, compressor  
13 station CD-08, Mackenzie River Delta.

14 Concern was expressed by  
15 Dr. W. Gunn as to the location originally selected  
16 for station CD-08. At his suggestion a new  
17 location was examined and a decision was made  
18 to re-locate the station 1.4 miles to the west.  
19 The plan was amended as part of the consolidation  
20 filings reflect this. While Dr. Gunn preferred  
21 this new location, his general concern relating  
22 to the location of processing plants and compres-  
23 sor stations within the delta remain. His  
24 views appeared to be shared by Dr. Tom Barry  
25 of the Canadian Wildlife Service. Accordingly  
26 a review was undertaken to determine whether or  
27 not CD-08 could be removed entirely from the  
28 delta. Although detailed assessment has not  
29 been completed, work has advanced to the point  
30 that Arctic Gas believes that such a move can





1 be made and has decided to re-locate CD-08  
2 to Tununuk Junction 16 miles to the east of  
3 its present location.

4 (b) Socio-economic considerations. The ques-  
5 tion of inter-action between construction  
6 facilities in communities has been raised a  
7 number of times before the Inquiry. Arctic  
8 Gas has considered this evidence particularly  
9 as it relates to communities of Fort Good  
10 Hope, Norman Wells, Fort Norman and Wrigley.  
11 On the basis of advice from its socio-economic  
12 advisors, Arctic Gas proposes to re-locate  
13 certain of its facilities in the vicinity of  
14 those communities. Particulars of those  
15 changes are set out in Appendix "A".

16 (c) Non-completion of Mackenzie Highway.  
17 At the time Arctic Gas filed its application  
18 it was anticipated that the Mackenzie Highway  
19 would be completed to Fort Good Hope. The  
20 government has since announced that highway  
21 construction is not presently planned to  
22 proceed beyond Wrigley. Without the highway  
23 from Wrigley to Fort Good Hope, additional  
24 wharves, access roads and airstrips would be  
25 required. Particulars of these are set out  
26 in Appendix "B".

27 (d) Northern staging areas. As logistics  
28 planning for the project has continued, Arctic  
29 Gas has determined that it would be advantageous  
30 to alter its plan which propose logistics



1 facilities at Hay River Enterprise, so as to  
2 include a new facility to be constructed at  
3 Axe Point, Northwest Territories. This is the  
4 same location proposed for use by Foothills.  
5 The site is previously disturbed, having  
6 been the location of a trans-shipment point  
7 during World War II. It would be connected  
8 to Enterprise by all-weather road which would  
9 require the construction of 15 miles of highway  
10 from the Mackenzie Highway to Axe Point.  
11 Revised pipeline route maps, five in number,  
12 and a location drawing entitled,

13 'Proposed Northern Staging Areas,  
14 Hay River, Enterprise and Axe Point,'  
15 are attached. Mr. Hemstock and Mr. Purcell  
16 will be able to answer questions pertaining  
17 to item (a) on March 16th. Mr. Williams will  
18 respond to questions as to locations of items  
19 (b), (c) and (d)."

20 Sir, the refinements that I  
21 have just referred to have necessitated certain changes  
22 to the panel's direct evidence, which was previously  
23 circulated. The major changes I have had written out  
24 and I would like to distribute them to participants  
25 to assist everyone in following the prepared evidence.

26 Sir, I would like to read that  
27 covering letter to Mr. Scott dated March 15th, to which  
28 I have attached the major revisions to the evidence  
29 that was previously circulated. I'll read the letter.  
30



" Because of the refinements made to the CAGPL plan as outlined in my letter of March 8, 1976, certain of the cross-delta prepared direct evidence which was filed several weeks ago, requires revision or amplification and I enclose the following:

1. The short passage to be inserted on page two of the route location evidence immediately following the second last paragraph.
2. Revised evidence in the construction plan.
3. An additional question and answer to be inserted in the design evidence on page two immediately following the answer to the second question on that page.
4. A revised page three of Dr. Gunn's evidence which is to replace the old page three."

The witnesses will make certain other minor modifications to their testimony when it is presented and I will ask them to indicate when their testimony departs from that circulated previously.

Finally, Mr. Bob Webb has advised me that through an inadvertance, I omitted a portion of his testimony pertaining to whales. Accordingly, I have had the third page of his evidence retyped and it is enclosed. Sir, I've distributed that letter to counsel.

In addition, sir, I will ask the panel to deal with the route revision that Dr. Tom Barry suggested in which you asked us to examine and you asked the panel to deal with when they were here.





1 As well sir, Dr. Hollingshead will comment on a concern  
2 raised by Dr. Peter Lewis related to the possibility  
3 of settlement in Shallow Bay.

4 Finally sir, I have for  
5 distribution the Arctic Gas evidence relating to the  
6 corridor concept. I've asked Mr. Carter to distribute  
7 that as we have a statement of the substance of evidence  
8 of Mr. R. A. Hemstock relating to "Corridor Concept For  
9 Parallel Transportation and Communication Modes".

10 Accompanying that, is a report  
11 by Avcon Aviation Consultants Limited dated February  
12 of 1976 entitled, "Historical Activity Data, Mackenzie  
13 Valley Corridor".

14 I intend to file that as an  
15 exhibit, sir. The copies have been shipped from  
16 Calgary and are in the possession of P.W.A. I have  
17 enough copies for all the participants. I will discuss  
18 with Mr. Scott and counsel for the participants the  
19 matter of the date for calling this evidence. As it  
20 relates largely to environmental subjects, I would  
21 propose to call it prior to Phase four getting under-  
22 way, but this is something that we'll discuss with Mr.  
23 Scott and the others, sir.

24 GARRY WOOD HOLLINGSHEAD,  
25 GRETCHEL V. MINNING,  
26 GUY LESLIE WILLIAMS,  
HOYT PURCELL, resumed

27 DIRECT EXAMINATION BY MR. MARSHALL:

28 Q Mr. Williams, I'd like  
29 to begin with you sir, in the route location evidence  
30 pertaining to cross-delta. Would you please describe





Hollingshead, Minning,  
Purcell, Williams,  
In Chief

1 the cross-delta routing insofar as it differs from the  
2 prime route alignment filed in March of 1974?

3 WITNESS WILLIAMS: Yes. First,  
4 it should be noted that with respect to the five  
5 alternative corridors discussed in the application,  
6 the cross-delta routing is applicable to the prime and  
7 offshore -- is applicable to the prime and offshore  
8 corridors. It would not be considered if the prime  
9 route was not available and the interior route was  
10 selected. Sorry, interior corridor.

11 On the cross-delta routing,  
12 the Prudhoe Bay supply line remains the same as the  
13 original prime route from the Alaska-Yukon border near  
14 Milepost 195 to a point south of Shingle Point near  
15 Milepost 290. From this point, the cross-delta  
16 routing proceeds in a more easterly direction to enter  
17 the Mackenzie River Delta at Milepost 320 near Moose  
18 Channel. After entering the delta, the route proceeds  
19 in an easterly direction to Shallow Bay, then north-  
20 easterly to a junction point, Milepost 372.4 on  
21 Richards Island about nine miles north of Tununuk  
22 Point.

23 Through this delta section of  
24 line, major crossings of West Channel, Shallow Bay,  
25 Middle Channel and Langley Channel are required. In  
26 addition, about 30 minor channels and five ponds or  
27 lakes will be crossed. I'd just like to add a foot-  
28 note to that. I've said here that West Channel is  
29 included in the major crossings. Actually, it's not  
30 really a major crossing, it's a fairly minor one.



1 But I've grouped it with this bunch because it's  
2 scheduled for summer construction. Also, I've referred  
3 to Middle Channel and elsewhere later on in other  
4 testimony, it might be referred to as a north arm of  
5 Reindeer Channel. They are one and the same channels.  
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19743

Hollingshead, Minning,  
Williams, Purcell  
In Chief

The revision of the Prudhoe Bay supply line also involves revision of the location of the supply line, from the Mackenzie Delta. From the origin, at Taglu, near the the north end of Richards Island, the delta supply line proceeds southerly along the west side of Richards Island, to a junction near Milepost 19.3. From the junction the line would move easterly, to rejoin the originally filed prime route west of Parsons Lake, near Milepost 43.5. This section of route would require<sup>a</sup> major crossing of the Mackenzie River east channel, near Tununuk Point. From Milepost 43.5, to Milepost 71, the route is identical to the originally filed prime route. A fairly direct route is being selected from Milepost 71, to rejoin the prime route near Thunder River at Milepost 172.13.

This section of the route passes the east side of Travaillant Lake, which while previously it was on the west side. Although the two routes are widely separated in this area, about 27 miles, the topography and soil conditions are quite similar. South of Thunder River, the route is the same as shown in previous applications, which includes the prime route as now amended<sup>i</sup>, thus including the route revision to the east of Fort Simpson.

Q Are there any other location changes made since the supplemental filing dated August 15, 1975, entitled "Supplement To Applications And Exhibits Relative To Alternative Routing For The Alaska Supply Lateral Across The Mackenzie Delta"?

A Yes, the location of the





Hollingshead, Minning,  
~~Williams~~, Purcell  
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Parsons Lake supply line was changed to conform with the recently selected location of the Gulf Oil processing plant. The supply line has been moved from the north to the south side of Parsons Lake. It now has a length of about 12.5 miles, and it's junction with the main supply line has been moved south about 11.5 miles.

The Niglintgak supply line has been added. It proceeds from the proposed location of the Shell Oil Niglintgak processing plant near the northwest side of Richards Island, in an easterly direction, to the proposed location of the Imperial Oil gas processing plant at Taglu. This proposed 24 inch diameter line would be about 10.75 miles long.

The proposed location of compressor station CD-08, on the Prudhoe Bay supply line, has been relocated to approximately 1.4 miles, in a westerly direction, and this next sentence is new.

Subsequent to filing this evidence, the decision was made to relocate station CD-08 to Tununuk Junction, a distance of 16 miles easterly. With this change, there will be a deletion of about 1.5 miles of all weather road, from middle Channel, from middle Channel to the former location of CD-08, and at the new location, that is the new location of CD-08 at Tununuk Junction; a 2,400 foot airstrip will be added.

The decision to use a satellite based communication system eliminates the need for most of the intermediate communication sites. A total of 51 sites, 21 in the Yukon and Northwest



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Williams, Purcell  
In Chief

1 Territories, are now not required, along with the access  
2 roads and helipads, previously proposed at these sites.  
3 The present plan requires -- typographical error there --  
4 requires only three communication towers to be located  
5 remotely from the compressor station sites in the  
6 Northwest Territories, and none in the Yukon Territories.  
7 The three sites are near stations MD-01, M-08, and M-12.

8 Q Thankyou Mr. Williams.

9 The Commissioner asked that Arctic Gas give consideration  
10 to the Amendment for Alteration to the cross-delta  
11 routing that was suggested by Dr. Tom Barry of the  
12 Canadian Wildlife Service. I understand that you met  
13 with Dr. Barry recently, and you have some comments  
14 with respect to the -- to the route and the amendment  
15 to that route that he proposed. Perhaps you could  
16 cover that now, sir.

17 A Yes. Mr. Commissioner,  
18 on February 11, 1976 you had a discussion with Dr.  
19 Barry with respect to the routing across the outer  
20 delta. In the transcript, and it's in volume 122, page  
21 18587, you asked Mr. Carter to have the cross-delta  
22 panel be prepared to discuss this suggestion; and  
23 personally I'd like to briefly mention the method that  
24 was used in selecting the route that was filed.

25 Northern Engineering was asked  
26 in October of 1973, to begin an in-depth study of this  
27 alternative routing. Mr. Hemstock, who was the proponent  
28 of the route, outlined the approximate location, which  
29 he thought may be environmentally acceptable. So  
30 following that, the best scale maps available were



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1 obtained, along with existing aerial photography, and  
2 a few alternatives were roughly selected in this area;  
3 and a reconnaissance was made in -- aerial reconnaissance  
4 was made in October of '73, and following that  
5 reconnaissance and the map study, the route that was  
6 tentatively selected for further study is this dotted  
7 red line here, and then the solid red line across the  
8 outer delta; which was approximately the same, I'm  
9 sorry, from here west was approximately the same as  
10 what was filed; and then in March and April of 1974, we  
11 conducted field studies, mainly soil drilling for soil  
12 samples, and soundings across the water bodies to get  
13 an indication of sub-bed -- or riverbed profiles.

14 And that work showed that the  
15 two small channels in the south running into Langley  
16 Channel, were narrow and very deep, and that would  
17 probably cause some construction problems. So, we  
18 started looking at a new -- another crossing farther  
19 north, in a wider part of the channel, but it's much  
20 shallower there, and in our opinion would have fewer  
21 construction problems; so that's the route that we  
22 ended up filing, the solid red line; and that's the  
23 route that was given to the environmental and other  
24 groups, to conduct -- to base their studies on. You  
25 really have to start somewhere, you can't go out and  
26 say, study the whole delta, so this was the route that  
27 was mainly selected by engineers, with assistance  
28 from Mr Hemstock.

29 So, the lines shown in blue,  
30 through here, is our best interpretation of the line





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Williams, Purcell  
In Chief

1 that Dr. Barry presented at this hearing in early  
2 February; and we plotted it on the 1 to 50,000 maps,  
3 and of course we, from an engineering aspect anyway,  
4 we've done -- we have done no work in the area, so we  
5 can't comment too widely on it. We can say that the  
6 blue route is about 10 miles longer than the red route.  
7 It has a shorter crossing of Shallow Bay, and probably  
8 shallower also. Dr. Barry says it's shallower, we  
9 don't have any information, but have no reason to  
10 believe otherwise.

11 What we would find maybe  
12 difficult with it is the crossing of this channel here.  
13 It's pretty hard to avoid a crossing that's not in a  
14 bad bend.

15 Q Is there a name on the map  
16 of that channel, Mr. Williams?

17 A It is a southern extension  
18 of Langley Channel.

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Purcell, Williams, Minning,  
Hollingshead  
In Chief

1 It's probably part of the  
2 Langley Channel system. Anyway, we don't have any  
3 profile across there but we would guess from our  
4 previous experience that it might be fairly difficult.  
5 Then we had a meeting with Dr. Barry in late February  
6 and we had a very good discussion and he looked at the  
7 route that we plotted out here, and noted the extra  
8 length that was required and he suggested that from  
9 his point of view he would be just as happy with the  
10 black line here that comes into the blue, and back here.  
11 His main concern, the way I understood it, was this  
12 part of the delta.

13 Q When you say "this part  
14 of the delta" you're referring to the west side of the  
15 delta?

16 A The west side of the  
17 delta, yes, west of Shallow Bay; and I think that was  
18 mainly from -- with respect to birds, but Mr. Hemstock  
19 can comment on that better than I can.

20 Again we don't have too much  
21 engineering information. The combination blue-black  
22 line would be six miles longer than the red line --  
23 solid red line filed. The crossing of Shallow Bay  
24 would be about 2½ miles longer, and the crossing of  
25 Reindeer Channel would be wider than the one selected  
26 further north. Again, Dr. Barry suggested that the  
27 water crossing of Shallow Bay, the water was probably  
28 more shallow than the solid red route.

29 I think that's about all we  
30 can say from an engineering aspect. But while Dr.



Purcell, Williams, Minning  
Hollingshead  
In Chief

1 Barry was in our office, we also discussed the matter  
2 that he raised with respect to the use of Dew Line sites.  
3 You may recall, I think, that he suggested that we  
4 should look at using them for compressor station sites.  
5 So we got into -- I don't have a map here that illus-  
6 trates it, but the route maps do illustrate it, you  
7 recall the rivers flowing into the Beaufort Sea on the  
8 North Slope. They fan out as they get to the coast  
9 line, and the Firth and the Malcolm Rivers are very good  
10 examples. We pointed out that trying to cross these  
11 wide fans near the coastal area would be very difficult  
12 and costly from an engineering aspect. He said that  
13 he appreciated that explanation, that he hadn't heard  
14 it before, and we went on to advise him -- and I don't  
15 know if you realize it, but we are using former and  
16 existing Dew Line sites to the greatest extent we think  
17 feasible, Komakuk, Shingle Point, and Tununuk Point  
18 are all proposed to be wharf and stockpile sites; but  
19 in our opinion it would be very difficult to make any  
20 one of those three, compressor station sites.

21 MR. MARSHALL: Thank you, Mr.  
22 Williams. Sir, do you have any questions of Mr.  
23 Williams about those matters?

24 THE COMMISSIONER: No, thank  
25 you very much.

26 MR. MARSHALL: I asked Mr.  
27 Hemstock, as well if he could look at it in order to  
28 be able to respond to the question you raised, sir.  
29 If you wish him to comment now, he can do so, or  
30 if you like, he can do so as part of the environmental



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1 panel that will follow this one. I leave it to you,  
2 sir.

3  
4 RUSSELL ALEXANDER HEMSTOCK,  
5 resumed:

6 THE COMMISSIONER: Well, maybe  
7 you should comment now, Mr. Hemstock. Is that all right  
8 with you people? Why don't you go ahead now then?

9 WITNESS HEMSTOCK: Mr. Com-  
10 missioner, Mr. Williams has outlined to you the various  
11 routes that arise from the proposal from Dr. Barry, and  
12 pointed out the variations. I should say that these  
13 are very similar to a route proposed to Arctic Gas  
14 by Dr. Gunn, who had somewhat the same concerns as  
15 Dr. Barry had with respect to bird life in the delta.  
16 We have a few general comments with regard to the  
17 environmental concerns on this particular route. We  
18 believe that the proposed Arctic Gas route is prefer-  
19 able to the Barry route from a re-vegetation and restor-  
20 ation standpoint, since the Barry route crosses areas  
21 with somewhat more relief, where bank stabilization  
22 would be of greater concern. From a mammal standpoint  
23 the Arctic Gas route traverses less important muskrat  
24 habitat. All the other impacts would be generally  
25 similar except for beluga whales. The Barry route  
26 would ensure even less interference with beluga and  
27 is preferable from that standpoint.

28 The Barry route crosses more  
29 lakes and permanent channels than the Arctic Gas route,  
30 and would have a greater potential impact on aquatic





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resources. We have discussed the route with Dr. Gunn and according to his analysis, the probable disturbance to nesting waterfowl is roughly equivalent on the two routes. However, Dr. Gunn prefers the Barry route because of the situation that exists during moulting and staging periods. This is principally because it avoids more of the areas which are heavily used by snow geese. On balance, Arctic Gas prefers the route it has applied for across the delta. It is shorter, less costly, and the overall potential environmental impacts appear to be roughly equal. The concern for beluga and staging waterfowl is essentially for the one year of construction, and we believe those impacts can be mitigated.

The Barry route, as Mr. Williams has pointed out, is six to ten miles longer, and the costs and potential impacts associated with the operating and maintenance of this additional length of line over the life of the pipeline are decided disadvantages.

MR. MARSHALL: Sir, I think the map that sets out the two routes that Dr. Barry suggested in the proposed Arctic Gas route should be filed as an exhibit. My apologies to counsel for not having had the comments written out and circulated in advance. If this causes difficulties, I'll undertake to recall the gentlemen who spoke, Mr. Williams and Mr. Hemstock, though I have a feeling that either or both of them might be here for a few days, if not longer.

THE COMMISSIONER: Yes.



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MR. MARSHALL: Thank you Mr. Hemstock.

Sir, I'd like to proceed now with the design evidence relating to cross-delta. Mr. Purcell, what work did the design group do in connection with the cross-delta amendment?

WITNESS PURCELL: We determined the pipe size for the dual water crossings necessary to provide as much capacity as the single 48 inch line. We relocated compressor stations on the revised route and then determined horse power and fuel requirements for each operating year.

Although it is not a result of the cross-delta route, the proposed satellite based communications system was investigated and recommended by the design group. In addition, of course, we've prepared the estimates of material costs associated with the cross-delta route and the concurrent revision of the lateral from Parsons Lake and the addition of the lateral from Niglintgak.

Q Please explain the selection of the pipe size for the dual crossings.

A The 36 inch pipe selected has about half the capacity of the 48 inch mainline pipe. That is each pipe has half the capacity. For the fifth year volume of 2,250 million cubic feet per day, only one 36 inch line is required and the other is insurance. For the optimum volume of 4,500 million cubic feet day which is the capacity of the Prudhoe Bay supply line with all stations installed. Both 36 inch lines would be required in order to carry



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Minning, Purcell, Hemstock,  
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1 the full volume.

2 Q How were the compressor  
3 stations located on the cross-delta route?

4 A We elected not to relocate  
5 stations on the portions of a pipeline route that did  
6 not change. Thus, the stations on the Alaska supply  
7 line from Prudhoe Bay to station CA-06 did not change  
8 and the stations on the mainline from MO-4 south did  
9 not change. Between stations CA-06 and MO-4, five  
10 stations were located on the cross-delta route, so that  
11 the section was hydraulically balanced. These stations  
12 are CD-07, CD-08, MD-01, MD-02 and MD-03. Station CD-07  
13 is a future station.

14 Q Were any of these five  
15 stations relocated after review by the environmental  
16 consultants?

17 A Yes. Station CD-08 was  
18 relocated to a point 1.4 miles west of its hydraulically  
19 balanced point following discussions with Dr. Gunn. No  
20 significant reduction in throughput results from this  
21 move.

22 Q Sir, this gets to a  
23 point where we've added a question relating to the  
24 relocation of station CD-08. Can the design of a  
25 pipeline system be changed to accomodate the relocation  
26 of compressor station CD-08 from the western verge of  
27 the delta to Tununuk Junction?

28 A Yes. One means of doing  
29 this would involve installing a station at Tununuk  
30 Junction which would have the same compressor and chiller





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1 sizes that were proposed for CD-08. This new station  
2 would be required for operating years four and five as  
3 was CD-08. Because station CD-08 was only just re-  
4 quired for years four and five, its installation re-  
5 sulted in excess horsepower being available at both  
6 stations CD-08 and station MD-01, the next station  
7 downstream. This excess available horsepower makes it  
8 possible to move the station 16 miles downstream to the  
9 junction without overtaxing it.

10 Q What effect on required  
11 ground facilities does the adoption of the satellite  
12 based communication system have?

13 A The repeater stations  
14 installed midway between compressor stations on the old  
15 terrestrial micro-wave system to provide line of site  
16 communications are not required on the satellite based  
17 system. In addition, the tower is a compressor stations  
18 can be reduced to an average of 100 feet in height  
19 because they are required only for mobile communications.  
20 Two antennas, one 15 feet and one 12 feet in diameter,  
21 are required at compressor and measurement stations.

22 An equipment building ten feet  
23 wide, 18 feet long and ten feet high is required with  
24 each pair of antennas. The antennas and equipment  
25 building are installed inside the fenced area at the  
26 stations. Three communications towers are required  
27 away from the pipeline right-of-way north of the 60th  
28 parallel to provide adequate coverage for the mobile  
29 radio system.

30 Q Thank you, Mr. Purcell.





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1 I'd like to deal now with the geotechnical evidence,  
2 Dr. Hollingshead. Could you please describe the general  
3 geology of the terrain which the cross-delta route  
4 traverses?

5 WITNESS HOLLINGSHEAD: The  
6 general geological setting is described in section 8 -  
7 B1-3.2 of the application. The terrain which underlies  
8 the cross-delta route is divided into three major  
9 physiographic divisions: the Yukon coastal plain,  
10 the Mackenzie Delta, and the Anderson plain. The  
11 Alaska supply lateral traverses the Yukon coastal plain  
12 in the Mackenzie Delta divisions of the Arctic coastal  
13 plain physiographic region. Within the Yukon coastal  
14 plain, the route traverses a wide variety of terrain  
15 types, approximately 40 percent of which is a thin  
16 layer of silty till over bedrock.

17 Within the Mackenzie River  
18 Delta, between Mileposts 319 and 372, the route traverses  
19 approximately 7 miles of distributary channels and 46  
20 miles of stratified sand, silt, clay and peat. The  
21 first 44 miles of the Taglu supply line traverses  
22 Pleistocene coast lands. This sufficual material  
23 consists primarily of deltaic sand and silt overlain  
24 in places by a thin layer of silty clay till.

25 Ice wedge polygons frequently  
26 occur in the flat depressions and sometimes in silty  
27 gravels. Occurrence of massive ground ice and pingos  
28 are more prevalent in the Pleistocene delta than  
29 in the modern delta. Through the Caribou Hills, Mile-  
30 posts 48 to 86, thin till overlies unconsolidated



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1 tertiary sand and gravel. Hummocky moraine deposits  
2 are also present. Thermokarst lakes and peat filled  
3 depressions are common. The pipeline crosses the  
4 Anderson Plain physiographic division between miles  
5 86 and 172.

6 This division includes the  
7 Campbell Lake, Sitidgi Lake depression  
8 which is an old river channel occupied by poorly drained  
9 ice rich silts and small shallow lakes. The Campbell  
10 Lake Hills immediately south of the Campbell Lake  
11 depression consists of silty clay till which varies  
12 in thickness from five to 20 feet over bedrock. Silty  
13 clay till in rolling and hummocky ground moraine  
14 deposits also cover bedrock along the portions of the  
15 pipeline route between the Campbell Lake Hills and  
16 Thunder River.

17 Q Would you describe  
18 briefly please the permafrost and ground temperature  
19 conditions the cross-delta route?

20 A The delta is located in  
21 the continuous permafrost zone. The depth of perma-  
22 frost in this area ranges from a few feet to several  
23 hundred feet, being thinner under the modern delta  
24 than under the Pleistocene delta. The permafrost is  
25 thinner under the modern delta because these are the  
26 youngest sediments in the dynamic delta environment.  
27 Because the delta environment is a dynamic, the perma-  
28 frost conditions are as well. Permafrost is aggrading  
29 upwards in areas such as flood plains where sediment  
30 is being deposited yearly. Permafrost is also aggrading



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1 downwards, particularly where it is thinner in the  
2 modern delta as it tends towards a thermal balance with  
3 the cold ambient air temperatures above.

4 On a more local basis, perma-  
5 frost conditions are changing as river channels migrate  
6 laterally and as existing small lakes and ponds drain  
7 or new small lake and ponds are formed due to thermo-  
8 karst action.

9 The top of the permafrost  
10 which we refer to as the permafrost table is generally  
11 within one to three feet of the ground surface but will  
12 be somewhat deeper immediately adjacent to water bodies.  
13 The main exception to this is where the ground surface  
14 is presently covered with water, i.e., rivers, lakes  
15 and ponds; or was covered with water in its recent  
16 history. That is, recently drained lakes, laterally  
17 moving river channels.

18 Under the larger river channels  
19 such as North Arm of Reindeer Channel and Langley  
20 Island Channel and East Channel, the permafrost table  
21 is either absent or located at a depth of many tens of  
22 feet under the river bed. This is because these  
23 channels are relatively wide and deep and have water  
24 flowing in them throughout the year. Under narrower  
25 or shallower water bodies such as much of Shallow Bay  
26 and several unnamed channels and ponds, the permafrost  
27 table is located at depths ranging from ten to over  
28 40 feet below the bottom of the water.

29 Several temperature sensors  
30 have been installed in the delta area in order to





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1 obtain temperatures of the ground. In general, the  
2 permafrost temperatures are warmer in the modern delta  
3 than in the Pleistocene delta.

4 Q Could you comment please  
5 on the seismic design of the cross-delta route?

6 A Dr. Newmark, our Seismicity  
7 Consultant has studied the new routing and has recommended  
8 for the segment within the Mackenzie Delta proper --  
9 that is, from Milepost 319 at the western boundary of  
10 the delta to just east of East Channel, that the system  
11 be designed for a maximum ground acceleration of ten  
12 percent G for ground motion effects as well as ten  
13 percent G for structural design conditions.

14 These values are very similar  
15 to those recommended for use in zone C elsewhere along  
16 the system. Cyclic shear tests conducted to date on  
17 sediments from the bed of Shallow Bay indicate that  
18 the resistance to liquefaction of the sands and silts  
19 in situ is in excess of that required to resist the  
20 design earthquake motions.

21 Q Would you please describe  
22 briefly the field studies which have been conducted  
23 along the cross-delta route?

24 A Several field investigations  
25 have been conducted along the proposed route and at  
26 facility sites in the Mackenzie Delta during the past  
27 two years. These have included drilling, soil sampling,  
28 measurement of channel ice cover, ice break-up observa-  
29 tions, channel soundings, and flow measurements in the  
30 major distributaries. The results of these studies



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1 have been reported in several volumes which are listed  
2 at Appendix A.

3 MR. MARSHALL: I'd like to  
4 file the appendix listing those as an exhibit, sir.

5  
6 A These reports document  
7 a total of 156 test holes, most of which are directly  
8 on the route. In addition, three test holes at the  
9 quarter points along the Shallow Bay crossing and 28  
10 test holes at potential wharf sites in the delta area  
11 were drilled during August of 1975.

12 The channel geometry of the  
13 major distributories was obtained in April and Septem-  
14 ber of 1974 and again in April and August of 1975. In  
15 addition, discharge measurements have been made in the  
16 major channels under both winter and summer flow  
17 conditions. Ice break-up observations have been made  
18 in the Mackenzie Delta region for three successive years  
19 1973, 1974, and 1975.  
20  
21  
22  
23  
24  
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26  
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30



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Detailed measurements of the ice thickness and conditions prior to breakup have been made. Field investigation of borrow sources along the cross-delta route were undertaken in July and August of 1975, and sources located on both the east and west sides of the delta.

Q We note that the preliminary designs of crossings for Shallow Bay in three of the major distributary channels have been included in the revised exhibits. Could you please comment on the basis for these designs?

A Yes sir. First of all, we have added the design discharge of the Peel River, which is 300,000 cubic feet per second, to the 100-year flow for the Mackenzie River at Point Separation, which is 1,300,000 cubic feet per second, to obtain a preliminary design flow value of 1,600,000 cubic feet per second. This flow has been distributed on the basis of observations made by the Water Survey of Canada, as well as our own field programs, and additional office studies to establish design flows for each of the four major distributaries. These design flows range from 300,000 to 600,000 cubic feet per second. We also recognize that the outer delta is subjected to extensive flooding during spring breakup periods, and summer wind storms, during which periods the ground between channels may be flooded to depths of four to eight feet.

Because of the low gradients of the delta channels, flow velocities are low, approxi-





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1 mately two feet per second, and the ice breakup is  
2 quiet. The ice appears to rot in situ, and is not  
3 particularly damaging to the shores and banks. There  
4 is no apparent evidence or possibility of appreciable  
5 heads of water being built up by a spring ice jam,  
6 because of the immediate overflow which is possible  
7 onto the low-lying land surfaces.

8 The crossings of the individual  
9 channels have been analyzed and designed with the same  
10 techniques and level of confidence as have the other  
11 major crossings along the Arctic Gas system. Because  
12 of the extensive flooding, the weighted length of the  
13 pipeline must be increased to cover most of the delta  
14 proper. Also because much of this length would be  
15 inaccessible for purposes of repair during the spring  
16 breakup period, we are proposing that 35 miles of the  
17 line be twinned to ensure continuity of service.

18 Q Dr. Hollingworth, --  
19 Dr. Hollingshead, I don't know who is going to sue  
20 first -- Dr. Peter Lewis had raised a question in his  
21 testimony before the Inquiry about the possibility of  
22 settlement in Shallow Bay. I asked if you could look  
23 at that, sir, and comment to the Inquiry on that.

24 A Yes, I'd like to add this  
25 comment at this time. Dr. Lewis in his direct testimony  
26 at pages 18912 to 18914 of the transcript speculated  
27 that there could be 1½ to four feet of differential  
28 sediment along the Shallow Bay crossing due to consoli-  
29 dation of sediments deposited in the bay. This was  
30 apparently based on records that he had of the





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1 Mississippi Delta. We have studied consolidation of  
2 the delta sediments and we find that the maximum  
3 possible total settlement would be in the order of five  
4 inches. This would require a deposition of about 17  
5 feet of material within the life of the project; that  
6 is a depth equal to the deepest water in the Shallow  
7 Bay crossing. Over much of Shallow Bay, not more than  
8 five feet of new material could be deposited. This  
9 would result in a total settlement of less than one  
10 inch.

11 THE COMMISSIONER: Thank you.

12 MR. MARSHALL: I'd like to now  
13 deal with the evidence relating to borrow, Miss  
14 Minning.

15 WITNESS MINNING: If there  
16 isn't a view graph present, we can just hand out copies  
17 of what I was going to show on the view graph.

18 MR. MARSHALL: Sir , there are  
19 a number of tables that have been included with Miss  
20 Minning's evidence. I think the participants have  
21 those. We could break and set up the view graph.

22 A There is also revisions  
23 to those tables, and I have a copy of that.

24 MR. MARSHALL: Perhaps we  
25 could pass those out.

26 A I think there are about  
27 15 copies of this.

28 THE COMMISSIONER: Do you  
29 prefer -- is it easier for you to explain this to us  
30 this way or on the view graph?



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1 A Oh, this is fine with me.

2 MR. MARSHALL: They're pretty  
3 clear copies, sir, and Miss Minning has 15 copies of  
4 them for distribution.

5 A Before I start reading  
6 I'd like to make some corrections in that testimony  
7 so that people will know the new numbers. On page 1,  
8 the first paragraph, the third line, the number should  
9 be 2,730,000 cubic yards. Next sentence should read --

10 THE COMMISSIONER: Could you  
11 tell where this is again?

12 A First page of my testimony,  
13 third line, first number in the line.

14 Q Yes, O.K.

15 A -- 2,730,000 cubic yards.

16 At the beginning of the next sentence on that same  
17 line, table 1 revised should be put in there.

18 MR. MARSHALL: And that's what  
19 you've just handed out?

20 A That's correct. The  
21 new table 1 revised does not have "Table 1" at the  
22 top. It's the second page in the stapled packet.  
23 On the fourth paragraph --

24 MR. SCOTT: Would you mind  
25 repeating the last correction?

26 A The packet that was handed  
27 to you, there was a table 1, the old table 1. The  
28 second page is the revised table 1, table 1 was  
29 omitted from the revised table 1 at the top of the  
30 page.



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THE COMMISSIONER: So it

should say at the top:

"Table 1 Revised."

A Yes, right.

MR. MARSHALL: So the total  
figure at the bottom of that page,

"Table 1 revised"  
would be 4,342,000.

A The total figure is  
correct. The only change on table 1 revised is near  
the top under:

"Cross-delta lateral,"  
that number has been changed from the original table 1.





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1 THE COMMISSIONER: So we can  
2 accept the figures on Table 1 revised as the figures  
3 you now stand by?

4 A Yes.

5 MR. GIBBS: Well it isn't really  
6 clear. Is there a change in the number under cross-  
7 delta lateral?

8 MR. MARSHALL: That's why you  
9 have the revised statement.

10 A Could I do  
11 these totals again? I'm sorry, totals cause so many  
12 problems, we've had trouble in all the hearings with  
13 all the totals and all the charts.

14 THE COMMISSIONER: Take your  
15 time.

16 A Perhaps we  
17 could come back to this revised Table 1. Can I do that  
18 now?

19 THE COMMISSIONER: Sure.

20 A Make the  
21 other changes. Table 2 revised, which is mentioned in  
22 the fourth paragraph, third line, should read "Table 2  
23 Revised", instead of "Table 2".

24 In the fifth line, it should  
25 read "approximately 1,800,000 cubic yards".

26 MR. GIBBS: Instead of one-four  
27 three-four, it should be one-eight.

28 A That's correct.  
29 Next paragraph, with the correction is, the second  
30 paragraph on the next page, the number in the third to



1 last sentence, which says 1,500,000, should say 400,000.

4 A That's  
5 correct, it's 400,000.

6 The total is correct on Figure 1

7 Now I'll start reading now.

8 MR. GIBBS: Mr. Commissioner,  
9 I'm not trying to be difficult but I still don't  
10 understand this. The witness corrected a number on  
11 page 1 of her prepared evidence in the first paragraph  
12 to 2,730,000; and that says "the cross-delta lateral  
13 between Milepost 320 on the west side of the Mackenzie  
14 Delta and Tununuk Junction on the east side, requires  
15 2,730,000". Now shouldn't that 2,730,000 appear under  
16 paragraph number 1 on the first page of your revised  
17 table.?

18 MR. MARSHALL: You have "Table  
19 1" and then if you turn the page, you have "Table 1  
20 Revised".

21 A I said it  
22 when I first started out that this second page is  
23 Table 1 revised, and it was left off of the second page.

24 MR. GIBBS: Then do we destroy  
25 this first sheet altogether?

26 A Yes, you can  
27 destroy that if you want. You can destroy Table 2  
28 as well, unless you want to use it to ask questions.

29 MR. MARSHALL: Seldom have  
30 you fought with a witness so strenuously when she was  
trying to help you.



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1 MR. GIBBS: I was about to  
2 say she has been well briefed.

3 MR. MARSHALL: I'd like to  
4 file then as an exhibit, Table 1 Revised, Table 2  
5 Revised, Table 3 is on two pages; Figure 1, Figure 2,  
6 and Figure 3, which you've handed out to us. That  
7 would be the next exhibit.

8  
9  
10 THE COMMISSIONER: All right.

11 MR. MARSHALL: I think Mr.  
12 Gibbs has caught up with us now. Miss Minning, would  
13 you care to go on with your evidence?

14 A: The cross-  
15 delta lateral, between Milepoint 320, on the west side  
16 of the Mackenzie Delta, and Tununuk Junction, on the  
17 east side, requires 2,730,000 cubic yards of borrow  
18 material. Table 1 revised shows these quantities,  
19 and other quantities required for the Richards Island  
20 supply line, including Niglintgak lateral and the  
21 Parsons Lake lateral. These quantities also appear  
22 on the project strip maps, submitted with the Alaska  
23 supply lateral, across the Mackenzie Delta volume.

24 On the project strip maps,  
25 granular material for the cross-delta lateral has been  
26 shown to come primarily from the bedrock exposure,  
27 GM-150, on the west side of the Mackenzie Delta, and  
28 from the Yaya Lake esker, which was two sites: GM-194,  
29 and GM--153; on the east side of the delta.

30 A sandy delta remnant, GM-135



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1 and the Yaya esker, are also shown as the principal  
2 material sites on Richards Island supply line. Kame  
3 Field, GM-133, is the borrow site shown for the Parsons  
4 Lake lateral. Northern Engineering Services has done  
5 field work on granular deposits, both east and west  
6 of the Mackenzie Delta, during the summer of 1975.

7 Abundant granular material  
8 is present on the west side of the delta. Figure 1  
9 shows a number of these deposits that were investigated  
10 during a 1975 summer field program. Deposits 1-17-AB12,  
11 1-17-AB9, 1-17-AB6, and 1-17-AB5, show good potential  
12 for providing sand and gravel that could be used for  
13 construction of a cross-delta route, in addition to or  
14 instead of bedrock at GM-50. A report describing these  
15 deposits is presently in press.

16 On the east side of the  
17 Mackenzie Delta, Northern Engineering Services has  
18 shown the Yaya esker as its primary source of granular  
19 material. Table 2 revised, gives a breakdown of the  
20 facilities, and the number of cubic yards of material  
21 that would be taken from the Yaya esker for these  
22 facilities. Approximately 1,800,000 cubic yards of  
23 material will be needed for the pipeline on the east  
24 side of the delta. It should be noted that of this  
25 total, approximately half of this material could be  
26 of DIAND class 2 or less in quality.

27 Figures 2 and 3 are maps of  
28 the east side of the delta. These maps show the Yaya  
29 esker and other borrow sources near Tununuk Junction,  
30 identified during granular material inventories by





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government and industry.

Table 3 gives details on quantities available, recovery depth materials, etc., in these deposits. Sources shown on Figure 2 and 3 are up to 45 miles from the pipeline junction, but barging or hauling over ice could make these deposits exploitable for use along the route. The Yaya esker complex shown as 107C-B2, and 107C-B3, on Figure 2, -- on Figure 2. The portion included in 107C-B3 has been studied in detail by Imperial Oil and was reported to contain approximately 9,000,000 cubic yards of granular material as of 1975.

Shell and Imperial plan to use at least 3,000,000 cubic yards or more of this material for construction of facilities in the Richards Island area. The western portion of the Esker complex, shown as deposit 107C-B2 on Figure 2, possibly contains an additional 400,000 cubic yards of granular material.

These figures indicate that within the two portions of the Yaya esker, there is still abundant material available to both the pipeline and producing companies. Further alternate sources are available in the Tununuk Junction area. Lesser quality material can be obtained from esker kame deposit 107C-B4, that's approximately 1,500,000 cubic yards, immediately north of the Yaya source, where good quality granular material can be barged or taken overland, from 107C-B1, 10,000,000 cubic yards, in the vicinity of Shingle Point.

Other good material is available to the south, in deposits 204 and 302, along



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1 the Mackenzie east channel, or deposits 301, 326, 324A  
2 and 323A, in the Caribou Hills, see Figures 2 and 3.

3 In summary it should be  
4 emphasized that abundant good quality granular material  
5 exists on the west side of the Mackenzie Delta, that  
6 the Yaya esker contains more than 9,000,000 cubic yards  
7 of granular material, that alternate granular deposits  
8 are available in the Tununuk Junction area, and that  
9 part of the pipeline material requirements on the east  
10 side of the Mackenzie Delta can be supplied with  
11 granular material of lower quality than DIAND class 1.

12 Q Thank you Miss Minning.

13 I would like to deal now with the --

14 MR. SCOTT: Mr. Marshall, it  
15 may be just a typographical error, but Professor Fyles, or  
16 Dr. Fyles has suggested to me that in the last paragraph  
17 on page 2, where it says Shingle Point, it should be  
18 Swimming Point. I presume that's right, is it?

19 WITNESS MINNING: That's right.

20 (WITNESS HEMSTOCK, aside)

21  
22  
23  
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30



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1 MR. MARSHALL: Is that right,  
2 Miss Minning?

3 A M-hm.

4 MR. MARSHALL: We're in Dr.  
5 Fyles' debt.

6 Q Mr. Williams, I'd like  
7 you to deal with the construc tion plan for the cross-  
8 delta. I should point out that because of some  
9 changes that were necessitated in the refinements to  
10 the Arctic Gas plan, I had Mr. Williams redraft  
11 the evidence so that one could follow it right through,  
12 so that was item 2 enclosed with my letter to Mr.  
13 Scott of March 15th.

14 Mr. Williams, would you please  
15 briefly describe how the adoption of the cross-delta  
16 routing, the addition of the Niglintgak supply line  
17 and the relocation of the Parsons Lake supply line  
18 affect the construction plan in the Northwest and  
19 Yukon Territories, firstly with respect to the overall  
20 construction schedule?

21 WITNESS WILLIAMS: These  
22 amendments result in a total reduction of about 95  
23 miles of pipe to be installed. In addition, the  
24 cross-delta routing requires substantial summer  
25 installation of major water crossing, and replaces  
26 several miles of 48 -inch pipe, 48-inch diameter pipe,  
27 with 36-inch pipe. These factors permit the reduction  
28 of total construction spread requirements in the sixth  
29 construction year, from five to three spreads, in the  
30 Yukon and Northwest Territories.





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1 The construction schedule  
2 for the fourth and fifth construction season is very  
3 similar to the original filing. The main change is  
4 a small reduction in the length of spreads E and F.  
5 The number of compressor stations required to be con-  
6 structed each year for the early operating years is  
7 unchanged.

8 Q Would you briefly des-  
9 cribe how the refinements listed in my letter of March  
10 8th affect the construction plan?

11 A Just to add something  
12 that's not in the text here, but you probably noticed  
13 in the consolidation filing that instead of -- because  
14 of all the confusion with calendar years previously,  
15 we have now gone to construction years. In the  
16 drawing section of the consolidation filing, there is  
17 a bar chart, and this is the one -- if we refer to  
18 drawing No. 4-2053-1001 entitled:

19 "Schedule by construction year,"  
20 which is --

21 THE COMMISSIONER: Let's just  
22 pause there and get that out. That's the consolidated  
23 delta filing, Miss Hutchinson, I think it's there.

24 A In the drawing section,  
25 and we start talking now about construction years 4,  
26 5, and 6. Previously they were first winter, second  
27 winter, and third winter, and you can get that out  
28 of this bar graph. It's confusing from previous  
29 discussions if you don't look at it.

30 Q They are all water-



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1 damaged, so that would precede the filing of the --

2 MR. MARSHALL: I don't know that  
3 it's necessary to have that. I think Mr. Williams is  
4 just pointing out that rather than referring to a  
5 specific year, the approach taken is to refer to first  
6 year, second year, etc.

7 Is  
8 THE COMMISSIONER: 4, 5, and 6  
9 the first, second and third winters of peak construction  
10 and pipeline?

11 A Yes sir.

12 MR. MARSHALL: That's really the  
13 point.

14 A It should be noted that  
15 construction of the proposed facilities, that is wharf,  
16 stockpile, airstrip, and all-weather road, at or near  
17 Axe Point are scheduled to be started in the first  
18 construction year and completed in the second year.  
19 The additional and relocated facilities between stations  
20 MO-6 (near Fort Good Hope) and station M-12 (near Wrigley)  
21 will be constructed with the appropriate lead time  
22 required for other similar facilities within the same  
23 spread section. Additional construction crews would  
24 be required to construct the added facilities such as  
25 wharves, airstrips, and roads deemed necessary by  
26 these changes. The relocation of compressor station  
27 CD-08 to Tununuk Junction will not significantly affect  
28 the construction plan. The haul distance for the  
29 granular material required from the Yaya area will be  
30 reduced. Details of these revisions are shown on  
the route maps included with Mr. Marshall's letter.



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1 Q How has the logistics  
2 plan been modified?

3 A The main change in the  
4 logistics plan is associated with the adoption of  
5 Axe Point as a major staging area for materials,  
6 equipment, and supplies to be transported by barge.  
7 The percentage split of materials to be shipped out  
8 of Hay River and Axe Point has not been determined.  
9 However, in calculating the acreage and borrow  
10 requirements for Axe Point shown on drawing No.  
11 11-0251-1003, a conservative approach has been taken  
12 in that it provides for a substantial installation.

13 Q Excuse me, Mr. Williams,  
14 that was one of the drawings that was enclosed with  
15 my letter to Mr. Scott.

16 A Yes sir, that's correct.  
17 Materials that arrive by rail for trans-shipment by  
18 barge through Axe Point will be off-loaded at Enter-  
19 prise and trucked to Axe Point. The locations of  
20 several other wharves and stockpile sites have changed  
21 due to the selection of the cross-delta route. The  
22 refinement made for socio-economic reasons and because  
23 of the Mackenzie Highway may not be available between  
24 Wrigley and Fort Good Hope. Details of these changes  
25 are shown on the revised route maps.

26 The total tonnage of material  
27 to be shipped by barge on the Mackenzie River system  
28 has been reduced by about 37,000 tons, or 2½%. As  
29 a result of this reduction -- I'm sorry, as most of  
30 this reduction is for material required in the sixth





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1 construction year, there will probably be no change  
2 in the estimated requirement of barge sets. The  
3 addition of the Axe Point site plus changes in wharf  
4 and stockpile sites between Fort Good Hope and Wrigley  
5 has not, however, been fully analyzed to determine what  
6 effect it has on the barge <sup>/set</sup> requirement. Because of  
7 the change in the construction plans in the Mackenzie  
8 Highway and the decision of Arctic Gas not to upgrade  
9 the airstrips at Fort Good Hope, Fort Norman, and Wrig-  
10 ley, eight additional 2400-foot airstrips are required.

11 STOL aircraft flights to and  
12 from the sites will generally originate and terminate  
13 at the commercial airports of Inuvik, Norman Wells and  
14 Fort Simpson, and I think on some of your copies  
15 maybe that top line is missing, is it? Would you like  
16 me to read it again?

17 Q How do the amendments  
18 affect the labor and construction equipment resource  
19 requirements?

20 A The only significant  
21 change in construction manpower requirement occurs  
22 in the sixth construction year. With the construction  
23 spread requirement in the Yukon and Northwest Terri-  
24 tories reduced from five to three, the total labor  
25 requirement would be reduced from about 4,400 to 3,300  
26 people. As the nine construction spreads are still  
27 required in the fourth and fifth construction years,  
28 and in that nine there are six spreads north of 60  
29 degrees, there will be no appreciable change in the  
30 overall equipment requirement.





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1 Q How are the natural  
2 resource requirements affected?

3 A The estimated quantities  
4 of natural resources required in construction of the  
5 proposed pipeline are shown in the following table,  
6 and should I read that in or --

7 Q Perhaps you could read it  
8 in. We'll have the table reproduced, sir, and will enter  
9 that as an exhibit.

10 THE COMMISSIONER: Well, this  
11 letter of yours, your letter is already in exhibit, and the  
12 table is --

13 MR. MARSHALL: I think that  
14 is in the second letter, sir. I'll have the table  
15 reproduced and we'll enter that with Miss Hutchinson.

16 A For the changes covered  
17 in the consolidated filing, the granular borrow material  
18 requirements remain about the same as in the initial  
19 filing. There are modest reductions due to shorter  
20 length of pipeline, and the elimination of most of  
21 the intermediate communication sites. There are off-  
22 setting increases due to the numerous work pads re-  
23 quired at the water crossings in the Mackenzie Delta  
24 area. For the recent refinements between Fort Good  
25 Hope and Wrigley, an additional 3,730,000 cubic yards  
26 of granular material are required. For the road,  
27 airstrip, stockpile and wharf site at Axe Point, an  
28 additional 1,680,000 cubic yards are estimated to be  
29 required. The requirement for water has been reduced  
30 substantially due to research and studies completed in



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1 snow and ice road construction, it is now estimated that  
2 considerably less water will be required than was  
3 thought at the time of filing.

4 Q Do the revisions stated  
5 earlier cause any other changes in construction plan?  
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1                   A     The above list of changes  
2     are the most significant. Other minor alterations are  
3     included in the text, maps and graphs, included in  
4     the consolidation filing, and your letter, Mr. Marshall.

5                   Q     Mr. Williams, I'd like  
6     you now to deal with the operations and maintenance plans  
7     related to cross-delta. Would you please briefly  
8     outline how the adoption of the cross-delta routing,  
9     the addition of the Niglintgak supply line, and the  
10    relocation of the Parsons Lake supply line affect the  
11    operations and maintenance plans.

12                  A     The addition of the 10.75  
13    mile Niglintgak lateral, the relocation of the Parsons  
14    Lake lateral, and a routing change for the 48-inch  
15    Prudhoe Bay supply line as filed by the applicant  
16    to cross the lower Mackenzie Delta, including the use  
17    of twin 36-inch pipelines across the delta will not  
18    alter the basic operating plan and maintenance concepts.  
19    The re-routing across the delta, however, does add a  
20    requirement for an additional special maintenance  
21    and amphibious transport equipment, useful for pipeline  
22    maintenance on flood plains and river crossings, and  
23    to ensure access to the pipeline crossings in the delta.  
24    The Inuvik District in the Northern Division is the  
25    only operating entity which would be affected by the  
26    three design changes in the Mackenzie Delta region.  
27    Operation of one additional compressor station in year  
28    3, and another in year 4, requires an additional two  
29    technicians in each of these years. The addition of  
30    the Niglintgak lateral will not have an effect on the





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1 manpower requirement for the Inuvik District.

2 Pipeline equipment requirements  
3 in the Inuvik District would be reduced because of the  
4 shorter route, and fewer compressor station sites.  
5 This next sentence is new. With the further relocation  
6 of <sup>station</sup> CD-08 to Tununuk Junction, the staging area for  
7 pipeline maintenance work in the Lower Delta would  
8 likely either be Tununuk Junction or Tununuk Point.

9 Maintenance crews would have special amphibious  
10 equipment -- I'm sorry, amphibious transport capability  
11 that are equipped with backhoes or A-frames with  
12 Gantry-type cranes, and hydraulic winches. Such  
13 equipment and balloon tired L.G.P. vehicles on land  
14 will ensure access to the pipeline in the summertime.

15 A small lay barge with  
16 dredging equipment used during construction would be  
17 strategically placed and this is another small change,  
18 at Tununuk Point and/or Inuvik. No additional pipeline  
19 equipment will be required to maintain the Niglintgak  
20 lateral.

21 Q How does the adoption  
22 of a satellite communication system affect the opera-  
23 tion and maintenance plan?

24 A The adoption of a communi-  
25 cation satellite alternative does not cause any change  
26 in the system operating and maintenance concepts,  
27 nor does it change the basic operating plan. The  
28 satellite system results in a reduction in the number  
29 of communication sites required for the system in that  
30 intermediate communication sites are mostly eliminated.



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1 The number of communication technicians is reduced  
2 accordingly. Present estimates of operating and  
3 maintenance personnel and equipment are included in the  
4 consolidated filing.

5 MR. MARSHALL: Thank you, Mr.  
6 Williams. Sir, that concludes the presentation of the  
7 direct evidence of this panel. I would ask Dr. Cooper  
8 and Dr. Clark to join the panel for cross-examination.

9 THE COMMISSIONER: Well, we  
10 will adjourn for coffee then.

11 (PROCEEDINGS ADJOURNED AT 3 P.M.)  
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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

JOHN IVOR CLARK,  
RICHARD H. COOPER, resumed:

MR. MARSHALL: I'd like to file  
as an exhibit a report that was circulated some time  
ago to the participants entitled, "Pipeline Related  
Borrow Studies, Cross-Delta Alternative Route and  
East of Fort Simpson Realignment", by Northern  
Engineering Services.

So, I've had Dr. Clark and  
Dr. Cooper join the panel as Mr. Goudge had requested.  
Both have previously been sworn.

Q Dr. Clark, I understand  
that your position with Northern Engineering and R. M.  
Hardy and Associates has changed since you were before  
the Inquiry last. Perhaps you could outline the position  
that you now hold.

WITNESS CLARK:

A Well, that's correct, Mr.  
Marshall. I've recently been appointed the vice-  
president and director of technical services of a  
parent company R. M. Hardy and Associates. This  
expands my responsibilities to projects which will  
include Northern Engineering Services but will also be  
involved with other projects undertaken by Hardy and  
Associates, although Northern will remain the major  
one with which I'll be involved. However, I will not  
be seconded to Northern, but I will be maintaining a  
direct contact in that I have been nominated as a  
director of Northern Engineering.

Q Thank you Dr. Clark. The





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panel is available for cross-examination.

CROSS-EXAMINATION BY MR. GIBBS:

Q From the point of Dr.  
Clark's new status, how many other members of this  
panel are not at this moment either seconded or em-  
ployed by Northern Engineering Services?

WITNESS CLARK: Mr. Cooper is  
the consultant to Northern Engineering Services. The  
other members of the panel are either all seconded or  
directly employed.

Q Mr. Williams,  
when was the present cross-delta route first looked at  
by Northern Engineering Services?

WITNESS WILLIAMS: Well, the  
first serious look, Mr. Gibbs, was in October of 1973.  
I should add though that we had had passing glances at  
it when we were determining a route to join the two  
sources of supply together. The initial work that we  
did on the project was before any major gas discovery  
had been made in the delta area and so it was a line  
from Prudhoe Bay to the south. Well then, -- oh, I  
don't know -- in '71 or something like that, when there  
were some discoveries of gas in the delta, we started  
looking at the combined system and at that time, as I  
say, we had a passing glance at it, but the engineering  
group at least thought that it would -- there'd be  
real environmental problems going across there, so it  
didn't get any serious consideration until October of 1973.

Q Did you begin looking at it





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Cross-Exam by Gibbs

1 seriously in October, 1973 under instructions from  
2 Arctic Gas?

3 A Yes, sir.

4 Q From whom did those  
5 instruction come?

6 A Well, it -- the instruc-  
7 tions, I think came from Gordon Walker who was the  
8 director of engineering for Arctic Gas at the time,  
9 but the concept, I think came from Mr. Hemstock.

10 Q Then the initiation of a  
11 serious study was not something that came about from  
12 within Northern Engineering Services, but from Arctic  
13 Gas management?

14 A The direction to proceed  
15 came from Arctic Gas management. The -- we had dis-  
16 cussions with Mr. Hemstock and Mr. Walker oh, as -- I  
17 can remember Mr. Hemstock mentioning this possibility  
18 as early as mid-'73 and it came up at meetings we had  
19 off and on until October and then the decision was made  
20 to proceed with a full blown study.

21 Q Up until that time, sir,  
22 you were dedicated to the -- what became known as  
23 the prime route?

24 A Well, our instructions at  
25 that time were to put about equal consideration to the  
26 coastal route and the interior route.

27 Q You abandoned the coastal  
28 route in the sense of an offshore coastal construction  
29 and came to the other one which you selected as the prime  
30 route?



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1 A Oh, yes, the offshore  
2 route, we never really considered it as a viable  
3 alternative, Mr. Gibbs. When I said coastal route,  
4 I meant the prime route.  
5

6 Q All right.

7 A The prime route as filed  
8 and the interior alternative were to be given equal  
9 consideration.  
10

11 Q What is the main reason  
12 that the cross-delta variation in the prime route has  
13 been chosen?

14 A I'm sorry, what was the  
15 main reason that the cross-delta route was chosen?

16 Q Yes.

17 A Economics.

18 Q It saves you \$150 million.

19 A Yes sir.

20 Q When Arctic Gas instructed  
21 you to have a look at it seriously in October 1973,  
22 what was the sequence of examining it? Did route come  
23 first and then geotechnical and then design and then  
24 environment or was there some other sequence of examina-  
25 tion?

26 A I think you came pretty  
27 close to it, Mr. Gibbs, yes.

28 Q Because those first ones,  
29 route, geotechnical and design all refer to the economics?

30 A Sure.

Q And the environment you



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1 felt you could fit in if the economics was right?

2 A No sir. No.

3 Q But it nonetheless--

4 A No, no, no, no, no.

5 Q Did I hear you say "no"?

6 But nonetheless, environment and socio-economics were  
7 the last things that you considered according to the  
8 sequence that I listed and you agreed .

9 A Yes, I think that's a  
10 logical way to do it, Mr. Gibbs. You have to start  
11 somewhere and I think the place to start is with a  
12 route that looks feasible, then go into in depth study  
13 in the other aspects.

14 Q All of those studies  
15 were resolved between October 1973 and August of 1975,  
16 sufficiently for you to file a volume showing it as an  
17 alternate route?





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1 I say August 1975 because  
2 the supplement relative to alternate routing, Exhibit  
3 266, has a covering letter dated August 15, 1975.

4 A Yes sir, as an alternate.  
5 I think that we had many discussions here about that  
6 time or prior to it, when we said it was important to  
7 have the environmental studies that were being conducted  
8 in 1975 completed before it could be considered -- be-  
9 fore we could consider to file it as an amendment.

10 Q But by August of 1975  
11 you were sufficiently confident you could file a  
12 detailed volume describing the cross-delta route, as  
13 an alternate.

14 A Yes.

15 Q And by November of 1975  
16 -- by November 7th, you were sufficiently confident  
17 that you could adopt the cross-delta as the prime  
18 route.

19 A Yes sir.

20 Q November 7th, to be  
21 precise.

22 A I'll take your word  
23 for it. It sounds about right.

24 Q Well, I was there when  
25 Mr. Goldie announced it on November 7th. It will be  
26 found on page 875 of the National Energy Board trans-  
27 cript, the late National Energy Board transcript.

28 A Yes sir.

29 Q And sir, in between  
30 August 15, 1975 and November 7, 1975, you completed



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Hollingshead, Clark, Cooper  
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1 enough of your studies to choose this cross-delta  
4 alternate.

3 A Yes sir.

4 Q And in that volume, which  
5 is Exhibit 266, Mr. Williams, in the -- under the tab,  
6 "Supplement to applications,"

7 which is a kind of covering letter, signed by L.G. Hurd,  
8 Director of Planning & Studies, at page 3 appears this  
9 sub-paragraph (b): The paragraph begins,

10 "Applicant points out and emphasizes that  
11 with respect to the alternative (that is  
12 the cross-delta route), sub-paragraph (b),  
13 the geotechnical aspects of the Mackenzie  
14 Delta terrain, and in particular the delta  
15 channels which would be crossed by the  
16 pipeline are in some ways unique as compared  
17 with other areas proposed to be crossed by the  
18 pipeline."

19 Now, can you tell me in what ways the cross-delta route  
20 is considered to be unique?

21 A Can I read that, please?

22 MR. MARSHALL: Is this pertain-  
23 ing to geotechnical aspects?

24 MR. GIBBS: Well, that's what  
25 it says:

26 "The geotechnical aspects of the Mackenzie  
27 Delta terrain, and in particular the delta  
28 channels which would be crossed by the  
29 pipeline are in some ways unique as compared  
30 with other areas proposed to be crossed by



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1 the pipeline."

2 I want you to list the aspects which Arctic Gas consid-  
3 ered as of August 15, 1975 to be unique.

4 MR. MARSHALL: Sir, if you're  
5 interested in the geotechnical aspects, perhaps Dr.  
6 Clark or Dr. Hollingshead might be able to respond more  
7 fully, as that is their field.

8 MR. GIBBS: Well, I merely,  
9 Mr. Commissioner, addressed Mr. Williams because he  
10 seems to be chairman of the panel, but if he thinks  
11 someone else should answer it --

12 A Well, I can start, and  
13 then maybe Dr. Hollingshead can continue. I would say  
14 the most unique aspect of it is the amount of water  
15 crossing per mile compared to the rest of the route.  
16 The percentage of water crossing in the 50 miles or so  
17 across there is very high.

18 Q Can you give a percentage  
19 figure?

20 A Oh, it would be in the  
21 15% range, Mr. Gibbs.

22 Q Thank you, I interrupted  
23 you there. You listed as the first unique aspect  
24 the amount of water to be crossed per mile. / <sup>A</sup> It's  
25 very flat terrain compared to the rest of the route.  
26 Mind you, the whole route is not that bad, but this  
27 is very flat. The soils in the delta area are extreme-  
28 ly homogeneous compared to other parts of the route.

29 WITNESS HOLLINGSHEAD: I think  
30 you might add to that that the channels are a little





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1 different, obviously different than anywhere else in  
2 the system, in that their distributary channels of  
3 the Mackenzie River divides the flow of the Mackenzie  
4 rather than being tributaries of the Mackenzie.  
5 They generally <sup>are</sup> of a much lower gradient type of  
6 stream, and are flowing in probably on an average in  
7 fine-grained materials in many of the other streams  
8 which are typical of the Gas Arctic system.

9 WITNESS WILLIAMS: The flooding  
10 <sup>/that the area</sup> experiences in the spring and on occasion in the summer  
11 is different than most of the rest of the route.

12 Q Does that complete  
13 your catalogue, Mr. Williams?

14 A That's all I can think  
15 of offhand, Mr. Gibbs.

16 Q And it would be in respect  
17 then to those unique matters that you would require  
18 further study before you could adopt the cross-delta  
19 route as being more than an alternative. Is that  
20 right?

21 A Yes sir. There was  
22 additional study that we wanted to do.

23 Q Now, sir, also in Exhibit  
24 266 under the same sub-paragraph (b) that I read the  
25 excerpt for you, appears this wording.

26 "While the applicant is confident that the  
27 pipeline can be installed safely and securely  
28 using conventional techniques and that it can  
29 be operated and maintained satisfactorily,  
30 additional site specific investigations which





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1 will assist in refining its designs and  
2 installation techniques are planned for the  
3 summer of 1975."

4 Now, can you tell me what site specific investigations  
5 to assist in refining design and installation techniques  
6 were made in the summer of 1975?

7 A Dr. Hollingshead will --

8 WITNESS HOLLINGSHEAD: Well,  
9 we certainly wanted to do and in fact did do channel  
10 soundings at the crossings in '75 to compare the channel  
11 topography, if you like, with what we found earlier in  
12 '74.

13 Q Is that the total amount  
14 of site specific study that you did to assist in refin-  
15 ing design and installation techniques?

16 A That was certainly one.  
17 I don't know that I would say that was the total effort.  
18 It was the primary effort.

19 Q Were there any others,  
20 Mr. Williams?

21 WITNESS WILLIAMS: There was  
22 a borrow study done, as Miss Minning has mentioned in  
23 her testimony, on both sides of the delta. Arctic Gas  
24 did do an excavation study in Shallow Bay to try and  
25 determine the stability of the bed when excavated.

26 WITNESS HOLLINGSHEAD: We also  
27 should have added we also did, of course, site specific  
28 studies of ice breakup in 1975 which were concentrated  
29 in the delta area.

30 Q You did it after the filing  
of this volume



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1 in August 15, 1975?

2 A No. Breakup was in June.

3 Q So where you say:

4 "Our plan for the summer of 1975," that  
5 is inaccurate or that statement was written much  
6 before August 15th.

7 WITNESS WILLIAMS: Well, firstly  
8 certainly the words would be written maybe as much  
9 as a month before that date, Mr. Gibbs, and a good  
10 part of this work was done in the summer. The other as-  
11 pect that we didn't mention was there was drilling  
12 and sounding work at wharf and stockpile sites in the  
13 delta.

14 Q Mr. Williams, have those  
15 studies the drilling results and sounding studies, borrow  
16 studies and excavation studies to determine stability,  
17 been completed? Have you received reports on all of  
18 those?

19 A No, we haven't. Miss  
20 Minning mentioned the borrow study. She can tell you  
21 where it stands right now. The one, the drilling and  
22 sounding work for wharf sites, there's quite a large  
23 crew in Calgary working on it. I couldn't give you  
24 a date when it might be ready, Mr. Gibbs.

25 Q And the excavation study  
26 to determine stability?

27 A Yes, that one wasn't  
28 done by Northern Engineering. I think it was Northcan  
29 that did that for Arctic Gas. I've seen a memo on it.  
30 I don't know what their intent is with respect to a



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1 report.

2 Q Well, sir, I wonder how  
3 between August and November of 1975 you could determine  
4 that the cross-delta should be the selected route rather  
5 than an alternate when you don't even have reports of  
6 the studies that you said in Exhibit 266 you had to  
7 carry out?

8 A Well, there are people  
9 in our organization that did most of the work, Mr.  
10 Gibbs, and we <sup>do</sup> talk to them from time to time, and if  
11 they had any particular problems I'm sure we would  
12 be aware of them.

13 Q But really, Mr. Williams,  
14 it wasn't your choice, was it? It was Arctic Gas  
15 management who decided that notwithstanding the results  
16 not being available, they were now going to take this  
17 as their preferred route?

18 A Well, I'd have to check  
19 the record, but it seems to me that when this thing was  
20 first brought up about a year ago now, Mr. Gibbs, I  
21 think we said that from an engineering aspect that we  
22 considered it to be feasible. But the important aspect  
23 was to wait for another year of environmental studies  
24 before the decision as to whether there would be an  
25 amendment or not be made, and in that same period we  
26 did some additional geotechnical work. But there was  
27 never any question in our minds a year ago that from  
28 an engineering aspect it was feasible.

29 Q Well then, as early as  
30 a year ago you decided that this should be the prime





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1 route rather than the then prime route.

2 (LETTER FROM CANADIAN ARCTIC GAS TO MR. SCOTT

3 RE CAGPC PLAN REFINEMENTS & MAPS DATED MARCH

4 8, 1976 MARKED EXHIBIT 493)

5 (APPENDIX "A" TO HOLLINGSHEAD'S EVIDENCE

6 MARKED EXHIBIT 494)

7 (REVISED TABLES 1 & 2 & 3, BORROW REQUIREMENTS,

8 FIGURES 1, 2, 3 BORROW DEPOSITS MACKENZIE DELTA

9 MARKED EXHIBIT 495)

10 (REPORT BY N.E.S., PIPELINE RELATED BORROW

11 STUDIES, CROSS-DELTA ALTERNATIVE ROUTE AND

12 EAST OF FORT SIMPSON REALIGNMENT MARKED EXHIBIT

13 496)

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1 A No, we don't decide that at  
2 all, Mr. Gibbs. We do our work, and issue reports,  
3 and you can give them to Arctic Gas and discuss them  
4 with their staff, and then these decisions are made.

5 Q Well between August of  
6 1975 and November of 1975, did you make a recommendation  
7 to Arctic Gas that they should switch to the cross-delta  
8 route as the prime preferable portion of the Prudhoe  
9 Bay supply line?

10 A I didn't, no.

11 Q Did Northern Engineering  
12 Services?

13 A I don't think so, Mr.  
14 Gibbs. I think that much earlier than that we said  
15 that the route was feasible, and here's the cost  
16 saving. The decision or the -- the decision or the  
17 waiting for the decision was as I say, based on the  
18 environmental aspect that was mentioned here a year  
19 ago.

20 Q Then it's your evidence  
21 that the only reason why the cross-delta route stayed  
22 as an alternative, until November 7, 1975, was for  
23 environmental reasons?

24 A I can't say that, Mr.  
25 Gibbs. I can say that we reported that the route  
26 was feasible, and would cost less than the prime route.

27 Q Well, as far as you were  
28 concerned, Mr. Williams, you had the location pinned  
29 down, you knew it was -- you'd satisfied yourself it  
30 was geotechnically feasible, and from a design point



1 of view it was feasible; all of those things. The only  
2 thing outstanding insofar as you were concerned was  
3 the environment?

4 A Sure, but at the same  
5 time we wanted to bring our geotechnical and engineering  
6 fieldwork up to a similar standard, that what had  
7 been applied to the prime route.

8 Q Now sir, also in the  
9 exhibit 266, on page 4, subparagraph C, the paragraph  
10 begins,

11 "Applicant points out and emphasizes that with  
12 respect to the alternative, subparagraph C,  
13 'Considerable environmental study of the outer  
14 delta area has been conducted by the applicant,  
15 and the results of this work are described in  
16 Section 14D herein. On the basis of these  
17 studies, applicant believes that a pipeline  
18 across the delta can be installed without  
19 significant detrimental impact.' Applicant  
20 is of the --"

21 A That's environmental  
22 impact, I think.

23 Q I'm sorry.

24 " -- significant detrimental environmental  
25 impact.' Applicant is of the view however  
26 that additional studies would be desirable,  
27 to confirm the results of its earlier work  
28 and refine its construction and operating  
29 techniques. Such additional environmental  
30 studies are scheduled by the applicant for the



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1 summer and fall of 1975."

2 Can you tell me what additional studies were done as  
3 narrated in subparagraph C?

4 A I think that should  
5 probably wait for the next panel, shouldn't it. They're  
6 in a better position to --

7 Q Well, if your counsel says  
8 that's who should answer it, then that's fine with me.

9 MR. MARSHALL: Well Mr.  
10 Williams probably has a general knowledge of the work  
11 that was going on, but we thought it would help you  
12 more, Mr. Gibbs, if we called a special environmental  
13 panel to deal with this, so that's what we've intended  
14 to do. I'd like to leave the question to that panel,  
15 if I may.

16 MR. GIBBS: All right.

17 Mr. Williams, at Milepost 290,  
18 is the point where the cross-delta route departs from  
19 the old prime route, isn't it?

20 WITNESS WILLIAMS: I think  
21 that's correct, Mr. Gibbs. The map I have doesn't show  
22 it, but I recollect that's about right.

23 Q And then, proceeding  
24 from west to east, you go about another thirty miles  
25 before you enter the delta, at about Milepost 320.

26 A Yes sir.

27 Q And then you proceed  
28 another sixteen miles to Milepost 336, before you  
29 replace the 48 inch pipeline with twin 36 inch pipeline.

30 A Yes sir.





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1 Q And those twin 36 inch  
2 lines continue for about 36 miles.

3 A Yes sir.

4 Q Now sir, will you have  
5 in front of you please the first alignment, or the  
6 first route map, with Mr. Marshall's letter of March 8,  
7 1976, which has been marked as an exhibit. Can you  
8 describe sufficiently accurately so one can mark one's  
9 own copy of that map, what areas will have summer work,  
10 and what ones will have winter work.

11 A Yes, going from west to  
12 east, the first summer work would be at West Channel,  
13 which is near Milepost 336. The next section would  
14 be across Shallow Bay, from about Milepost 339 to  
15 343.3; and the next piece would be across the middle  
16 channel or the north arm of the Reindeer Channel, near  
17 Milepost 355; and the last piece on that section across  
18 Langley Channel, near Milepost 367.

19 Q And all of the rest of  
20 that route will be winter construction?

21 A Yes sir. That's the  
22 present plan.

23 Q Well sir, in using the  
24 word summer and winter will you tell me what months  
25 you consider to be summer months for purposes of this  
26 construction?

27 A Mid-June to the latter  
28 part of September, somewhere between mid-September  
29 and the end of September.

30 Q Then it follows that the



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others  
are the winter months?

A Yes sir, that would start  
in late October, through to April sometime.

Q And is it your evidence  
that you can engage in construction, actual construction  
activities, during those months from mid-June to late  
September, and from late October to April, for winter  
purposes, or is there some portion of buildup period,  
and wind down period?

A Well, the constriction on  
the summer construction, and for the minute we'll just  
talk about engineering aspects, rather than environmental.  
The summer construction restrictions are the -- when  
the ice is out in the spring, and similarly in the fall,  
when there's too much ice to work on the water in the  
fall. Other things being equal, for that summer period,  
from an engineering aspect, we would like to pretty  
well go -- start as soon as possible in the spring,  
and hopefully finish before freeze up.

Q And as I understand your  
evidence, you expect to, or plan to construct all four,  
or carry on with all four of those summer activities in  
the same summer, the four that we marked on the map.

A No not quite, Mr. Gibbs.

Q I see.

A The crossing of the east  
channel near Tununuk Point, and the crossing of  
Langley Channel, are done first on the bar graphs, on  
the pipeline construction schedule, I'm looking at  
Figure 2, Mr. Gibbs; and it shows the east channel and



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1 Langley Channel constructed mainly in the fourth  
2 summer season; whereas West Channel, Shallow Bay,  
3 and Middle Channel, are constructed in the fifth  
4 construction year, I should say, rather than summer.  
5 It's a summer season but it's in the -- the fourth  
6 and fifth construction years.





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THE COMMISSIONER: What was the division again? Which channel was it constructed in the fourth summer season?

A East Channel, which is on the main stem and Langley Channel which is on the Pruhoe Bay supply line. The following summer, then are Middle Channel, Shallow Bay and West Channel.

Q Yes, so all of these, what you have described as major crossings with the qualification you gave us earlier on the cross-delta route except the crossing of the Langley Channel, will be in the fifth construction summer.

A Yes, sir.

MR. GIBBS: And all of the winter construction is in the winter of year six for that cross-delta route?

A Yes sir.

THE COMMISSIONER: That's the sixth winter?

A It is the winter season in the sixth construction year, yes.

THE COMMISSIONER: That's right.

- MR. GIBBS: Mr. Williams, I referred, I think, to construction activities and I want to list them and ask you if <sup>you</sup> agree with these being the activities that are going to be carried on through that construction purpose, whether winter or summer. Mobilization of vehicles and manpower, grading, pipe



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1 stringing, ditching, bending, levelling, coating,  
2 lowering into the trench, weighting and anchoring,  
3 backfilling, gauging and cleaning and testing and  
4 revegetation.

5  
6 A The only one I had trouble  
7 with was the levelling. Did you say levelling, Mr.  
8 Gibbs?

9 Q Yes, I did.

10 A Levelling of what?

11 Q Well, I'm not sure. I  
12 got that out of one of your volumes. I'll find it this  
13 evening and bring it to your attention.

14 MR. MARSHALL: I thought you  
15 said grading.

16 MR. GIBBS: I beg your pardon?

17 MR. MARSHALL I thought you said  
18 grading.

19 MR. GIBBS: I said that as  
20 well.

21 Bending,  
22 levelling, coating, lowering but the levelling doesn't  
23 mean anything to you?

24 A I'm having a little  
25 trouble with it. If you got it out of our application,  
26 I'd <sup>suspect</sup> that it's a typographical error, but I'm not sure.

27 Q Well, you had the volume  
28 consolidated filing drawings, exhibit 453 in front of  
29 you.

30 A Yes sir.



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Did you have welding in  
your list?

Q Yes.

I introduced  
levelling, it should be grading, rather than levelling.

THE COMMISSIONER: No, I don't  
think you did.

MR. GIBBS: The list that I  
got was from your constructions drawings and it was this:  
mobilization, grading, pipe stringing, ditching,  
bending, welding, coating and I put levelling in which  
I shouldn't have, lowering, weighting and anchoring,  
backfill, gauge and clean, testing, cleanup, restoration  
and revegetation, demobilization.

A Yes.

THE COMMISSIONER: Levelling  
should be welding. Doesn't that all make sense?

MR. GIBBS: That's probably  
what it should have been was welding instead of levelling.  
I will quote my piece of dogeral too, if you're not  
careful.

Mr. Williams, it's your  
evidence that in Shallow Bay, all of those activities  
can be carried out in one summer from mid-June to  
late September.

A Yes sir. From when to  
when?

Q Well, Mid-June to late  
September which is what you defined as summer.



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A Yes, yes. Yes sir.

Q I'm not going to leave  
it that easily, I'm coming back to it, Mr. Williams.

A I wouldn't be surprised.

Q Just to digress a  
moment though, why do you put in two 36 inch lines in  
place of a 48?

A Well I don't know if I  
can add anything to what Mr. Purcell said in his direct  
evidence, Mr. Gibbs.

Q Well I didn't understand  
to give the reason why. Perhaps he will. I thought  
he carefully avoided saying why.

WITNESS PURCELL: My under-  
standing is that it's the same situation as the other  
rivers that are classified as major that at certain  
times of the year they would present a delay if the  
pipeline had to be repaired, and for that reason, two  
pipeline crossings were installed.

Q Mr. Purcell you said "my  
understanding". Was it not your recommendation to put  
in the two 36 inch lines?

A No.

Q I see. Who's recommendation  
was it? Where did it come from?

WITNESS WILLIAMS: In the  
very first report that we put out on the engineering  
report, which I think is dated June, '74, Mr. Gibbs.  
I think we -- we showed three, -- I think three possible





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alternatives. One was a single 48. One was a partially looped 48 and the third one was a twin 36. We've provided Arctic Gas with cost estimates for each of the three cases. On balance, it was Northern Engineering's recommendation that the twin 36 inch line be adopted. It got a lot of discussion and it was finally decided that that was the way to go in the filing.

Q And, as I take it, the basis for it, the reason given is that it provides insurance against interruptions in service.

A That would be the major consideration, yes.

Q Are there other?

A Well, certainly a 36 inch line is easier to install than a 48 inch line. This of course, is in turn reflected in the cost estimates. Mind you, two 36 inch lines cost more than a single 48 but the difference in the two, we didn't think was that significant and the reliability that two 36's gave outweighed the additional cost in our opinion.

Q Well sir, what bothers me about the insurance aspect is this; that your 48 inch line prior to the point where it becomes twin 36's is designed to carry 4½ billion cubic feet per day when fully pressured. Is that right.

A Yes sir.

Q As I understand Mr. Purcell's evidence, that's what two 36 inches will carry so that when you get the Pruhoe Bay mainline up



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to 4½ billion cubic feet day, your two 36's will be  
also be operating at capacity.

A Yes sir.

Q Then where is the  
insurance then if you add the compression to build the  
Pruhoe line up to full volumes, don't you have to  
put in two more 36's if you're going to maintain your  
insurance aspect?

A If you were insuring  
against 100 percent throughput, that would be the case,  
Mr. Gibbs. But, the -- if one of the 36's went out,  
at least you can get about half of the -- or I'm sorry,  
it would be probably more than -- this is  
Mr. Purcell's area, but I think it's more than half  
of the throughput through the line and that's a lot  
better than nothing.

Q But sir, --

WITNESS PURCELL: One  
correction, Mr. Gibbs. You could get the insurance  
plan installing just one additional 36 inch line.

Q All right, sir. Is it  
Arctic Gas plan when the additional compression is  
added to build the Prudhoe Bay lateral up to its  
4½ billion cubic feet a day to add one or more 36 inch  
lines across the Mackenzie Delta?

WITNESS WILLIAMS: I would doubt  
if they've given any consideration to that, Mr. Gibbs.  
We have not done a study on it.

Q Well sir, as I recall



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1  
2 your evidence, the main reason for putting twin 48's  
3 under the major river crossings down the valley, was so  
4 that you could not even have a diminution in service  
5 if one broke. But that appears not to apply across  
6 the delta. Is that right?

7 A Not entirely. The  
8 system proposed has two areas of supply; one at  
9 Prudhoe Bay and one at -- in the Mackenzie Delta. The  
10 leg that we're talking about only carries the Prudhoe  
11 Bay gas, so the delta gas can still go in the main  
12 stem and as I say, if you have a failure in one of the 36's  
13 a good part of the Prudhoe Bay gas can go. You're  
14 not completely out.

15 Q But sir --

16 A It's quite a bit different  
17 proposition, I think, running 36 miles of dual 48 inch  
18 as compared to two or three at a major river crossing.  
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Q In logic, if you only need two 36-inches across the Mackenzie Delta, that will ensure against total service interruptions, doesn't it follow that that's all you need under the major river crossings down the Mackenzie Valley?

WITNESS HOLLINGSHEAD: If I might say, Mr. Gibbs didn't quote Mr. Williams quite right.

MR. GIBBS: Well, correct me if I misquoted him.

A I'm not sure if I remember exactly what you said now, but I'm quite certain that it wasn't as Mr. Williams put the case earlier.

WITNESS PURCELL: Mr. Gibbs, I think Mr. Williams said that the supply line carrying the Alaskan gas thru the fifth year of operation, which is what is shown in the filing, only carries 2½ billion cubic feet a day, it provides only half the gas. The main line, of course, carries all the gas, it carries 4½ billion cubic feet per day. So in that sense, one of the 36-inch lines across Shallow Bay, across those water crossings, has the same capacity with respect to its fifth year volume as one of the 48-inch dual river crossings does on the main line.

Q Yes, Mr. Purcell, and if Mr Williams is prepared to admit to me that when the Alaska portion is powered up and carrying 4½ billion cubic feet a day will need across the delta another one or two 36's, or a 48, to maintain the insurance,



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1 I'm content to leave it.

2 A I don't think anyone  
3 can say that I think we can all speculate about the  
4 decision-making process, and I would expect that it  
5 would go something like this, that the line under  
6 the volume shown here would be operating for four  
7 years, from years 2 through 5, there would be quite a  
8 lot of experience gained, it could be monitored for  
9 movement. <sup>If</sup> the experience had been very good, Arctic  
10 Gas might decide not to buy the insurance when the  
11 volumes increased to 4½ billion. On the other hand,  
12 they might decide to install a third 36-inch line which  
13 would provide a complete spare or complete insurance.

14 If you brought this up once  
15 I guess we should get the numbers right. If the  
16 supply line from Prudhoe Bay were fully powered, and  
17 one of the dual 36-inch lines was out of service for  
18 its entire length, the amount of gas that could be  
19 transported from Prudhoe Bay would be three billion  
20 cubic feet.

21 THE COMMISSIONER: A 36-inch  
22 line?

23 A In one, yes sir.

24 MR. GIBBS: Q With compressor  
25 stations 07 and 08 located as you now have them?

26 A With the -- yes, that  
27 reflects the move to the junction of the compressor  
28 station CD-08. Now that could be improved by installing  
29 a cross-over between the two 36-inch lines so that if  
30 there was an outage on one you would only lose half of



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1 it. In that case the single line could carry 3,570,000,000  
2 cubic feet per day, and with two cross-overs the --

3 THE COMMISSIONER: How much  
4 with one cross-over?

5 A 3,570,000,000 cubic feet.  
6 That's a pretty good proportion of the total throughput.  
7 A person could put in two or three cross-overs and  
8 further increase these throughput capabilities, so that  
9 would be another option that Arctic Gas would have.

10 Q A cross-over is a line  
11 from one pipe to the other?

12 A Yes, simply connecting  
13 them so that any segment can be isolated.

14 MR. GIBBS: But there's nothing  
15 in your plans for any of those cross-overs, is there?

16 A For the volumes up through  
17 the fifth year they're not required in order to maintain  
18 the volumes above the designed throughput.

19 Q Yes, and to put them in  
20 you'd have to bring in your crew and excavate and construct  
21 the cross-over.

22 A That's correct. It would  
23 be additional construction. You have to remember it  
24 could be done without taking the pipeline out of service  
25 or without impairing the gas throughput. One line  
26 could be taken out of service prior to the time the  
27 gas volumes increase. The attachment of the cross-over  
28 made, the gas then switched to go through that line,  
29 the other line taken out of service and the cross-over  
30 completed. I grant you there would be additional





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1 construction.

2 Q And there's nothing in  
3 your operating and maintenance plans to cover that?

4 A No, something like  
5 that is beyond the term of the application.

6 Q Then, sir, all of those  
7 speculative reasons which you have given me for two  
8 36-inches, and the insurance they will provide, apply  
9 equally to the other major river crossings where you're  
10 putting in two 48s, don't they?

11 A Well, we've talked about  
12 that before and the difference is in the gas volumes.  
13 Now I think you know as well as I do that a 36-inch  
14 could carry 4½ billion cubic feet. But there would  
15 be a considerable pressure drop. I haven't checked  
16 it out, I don't know what the capacity on the entire  
17 pipeline, on the main line of the pipeline would be .

18 THE COMMISSIONER: Excuse me.  
19 You have lost me, Mr. Purcell. A 36-inch line could  
20 carry 4½ billion cubic feet?

21 A In these very short  
22 sections across the river there would be --

23 Q A pressure drop means  
24 there's just not that much gas moving through as there  
25 would be in a 48-inch line. Isn't it a notional thing?  
26 Am I -- this may be a point where we have to go back  
27 to square one to make sure I understand you, but I  
28 thought that you were moving 4½ billion cubic feet  
29 through the 48-inch line at 1,700 p.s.i.g. or whatever  
30 it is, which is an extraordinary pressure, and you had





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1 to have specially strengthened steel to accommodate  
2 the pressure, the whole idea being to get these enormous  
3 volumes this great distance to the middle of the  
4 continent on an economic footing. Well then, through  
5 your 36-inch passage, so to speak, you're saying you're  
6 going to get it all through, it just takes longer so  
7 the pressure in the main line then is down. Do I  
8 understand you?

9 A Yes, sir, the pressure  
10 wouldn't be increased at any point.

11 Q There's not that much  
12 gas once you get to the main stem on the other side  
13 of the delta. That's the problem, isn't it?

14 A Well, I didn't entirely  
15 follow you. Maybe I could explain it my way and we  
16 can get together.

17 There is not much pressure  
18 drop in a mile of pipe, a mile of 48-inch pipe carrying  
19 full volumes, it's something like five or six pounds  
20 per square inch. Now if twice the amount of gas is  
21 put through, I think the pressure drop would go up,  
22 let's say, from 5 to 40 pounds. Now that wouldn't be  
23 economical in a long pipeline. The compressor stations  
24 would be five miles apart instead of 50 miles apart.  
25 But for a short section it's not a large increase in  
26 pressure drop, and under most conditions of the year,  
27 most times of the year there is some excess horsepower  
28 available in a compressor station downstream that could  
29 pick up that extra pressure drop without impairing the  
30 throughput. I haven't done the calculations, I'm just



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1 guessing at these numbers. But that's -- does that  
2 help to make it clear?

3 THE COMMISSIONER: Yes. I  
4 haven't made it all the way but we may have to return  
5 to this.

6 MR. MARSHALL: Sir, if I could  
7 follow through on your thought, you were talking about  
8 losing one of the dual lines under a river crossing,  
9 and the point would then be, well, what happens? Can  
10 you get the same volume of gas across the river and  
11 have to pick up the additional compression requirement  
12 downstream. It seemed to me that's where you were lead-  
13 ing. Maybe Mr. Purcell can follow through on it.

14 A Well, we'd have to make  
15 the calculation. I don't think there would be a large  
16 drop in throughput if the dual river crossings on the  
17 mainline would be 36-inch.

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1 THE COMMISSIONER: But if a  
2 36 inch line were out for three or four months, you  
3 wouldn't be getting 4½ billion cubic feet a day  
4 through, would you? Let's suppose it was your route  
5 there has those dual crossings on the top,  
6 on the red line there; don't have any crossovers, there  
7 isn't a third line. If one of them is out for six  
8 months, let's say, you're not going to get as much gas  
9 to the mid continent, are you?

10 A We're talking now about  
11 the 2½ billion cubic feet?

12 Q No, we're talking --  
13 well, 2½ billion cubic feet is in your fifth year, but --

14 A Yes sir.

15 Q -- and I think up to that  
16 point we're all with you, in that you have the same  
17 insurance as you have at the major river crossings with  
18 the two 48 inch pipes; but Mr. Gibbs is moving beyond  
19 that and saying all right, let's suppose you don't have  
20 excess capacity, 50% excess capacity in that pipe from  
21 Prudhoe Bay, after the fifth year; but let's suppose  
22 you want to bring larger volumes in, which means looping  
23 the main stem; but given that hypothetical situation,  
24 you can't live for very long with only one 36 inch  
25 pipe to take you across the delta. I thought that's  
26 where all this is leading.

27 A Well, I think we got to  
28 that point, and that's true, because of the long  
29 distance involved, there's an appreciable loss in  
30 throughput, but we're talking about 36 miles here,





1 so that's how we got to the number of 3 billion cubic  
2 feet, with no crossovers, and 3½ billion with one  
3 crossover; that's quite true. If there were an outage,  
4 in the 36 inch line, that would be the limit, with all  
5 the compressor stations installed.

6 Q Yes. The limit would  
7 be 3 billion cubic feet, and 3,570 with one crossover.

8 A Correct.

9 Q That's the best you can  
10 do.

11 A Yes sir.

12 Q Well, if  
13 it's enough that I understand that, I understand it,  
14 so maybe I'd better keep my mouth shut. So you carry  
15 on, Mr. Gibbs.

16 MR. GIBBS: Doesn't it follow  
17 then, Mr. Purcell, that certainly if you want to  
18 maintain the same insurance, when that Prudhoe Bay 48  
19 is operating at capacity, you're going to have to do  
20 something with those twin 36's. Crossovers, or an  
21 additional line, or something to maintain the same  
22 insurance.

23 A Yes, to have the  
24 capability of carrying 4½ billion cubic feet, you'd  
25 have to do something.

26 Q Now sir, why not  
27 continue those twin 36's to the western edge of the  
28 delta, that additional 16 miles?

29 A I thought they were to  
30 the western edge of the -- well, to the point where it's



1 it's difficult to repair a failure, my understanding  
2 they've been taken that far.

3 Q It's your evidence then,  
4 is it Mr. Williams, that there is not a difficulty  
5 between Milepost 320 and Milepost 336, in the repairing  
6 of failures?

7 WITNESS WILLIAMS: That's  
8 true, Mr. Gibbs. Our spring breakup observations show  
9 that that side of the delta does not receive or get  
10 flooded to the extent that the eastern side of the  
11 delta is flooded, and I think the same thing applies  
12 with respect to the summer storms.

13 Q But it does, none the less,  
14 get flooded, like the rest of the delta does?

15 A Well, not the two summer --  
16 I'm sorry -- the two spring breakups that I have  
17 watched, Mr. Gibbs. It's has been comparatively dry  
18 over there. There's the normal surface runoff, but  
19 not flooding.

20 Q In your judgement then,  
21 there's not going to be a time when you can't get in  
22 there on land to repair a break?

23 A In my opinion, if it did  
24 occur, it would be for a much more brief period than  
25 the eastern side of the delta.

26 Q A much more brief period  
27 when your access would be restricted?

28 A Yes sir.

29 Q And like how brief is  
30 brief?



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1 A Well, as I say, I've  
2 looked at it for two springs, and when the eastern  
3 side of the delta was flooded with two to three feet  
4 of water, it wasn't on the west side; so in the springs  
5 that I watched there'd be not period, but the records  
6 aren't that long. I don't think anyone could guarantee  
7 that it's never going to happen, but our information  
8 from looking at it, and talking to people that have  
9 observed it, is that that's the usual; that it doesn't  
10 get flooded in the spring like the eastern side.

11 Q Or with summer storms?

12 A Well, I haven't witnessed  
13 one of those.

14 Q No, but from the records --  
15 I realize you haven't witnessed them all.

16 A I think we talked to  
17 Dr. Barry about it, and there might be something in his  
18 evidence to that effect. It seems to me that I read  
19 that in his evidence not too long ago.

20 Q Well, can I sum it up this  
21 way? Insofar as you and your panel are concerned, there  
22 are not -- there's no knowledge, or you know of no  
23 records of flooding, either in springtime, or by  
24 summer storms, of the western part of the delta? Perhaps  
25 Miss Minning does, but do you?

26 A No, something else. Not  
27 to my knowledge, or anyone that I've talked to. Miss  
28 Minning was just pointing out that in the summer storm,  
29 if there is flooding, it only lasts a day or two.

30 Q Am I right in this,





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Minning, Clark, Purcell  
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1 Mr. Williams, that the soil composition across the delta  
2 is fairly consistent, and that it's mostly silt and  
3 sand?

4 A Yes sir.

5 Q And this applies both on  
6 the areas where there is water, and where there's land  
7 above water level?

8 WITNESS HOLLINGSHEAD: It's,  
9 I think comparatively uniform, but I would say it  
10 probably ranges greater than silt and sand, there are  
11 certainly some clays and peats.

12 Q But it's primarily silt  
13 and sand?

14 A I suppose, if you wanted  
15 to pick one, it's primarily silt size materials.

16 Q All right sir.

17 Mr. Williams, in your evidence  
18 you spoke about major crossings, and I have never been  
19 sure what you meant by major. Could you define it for  
20 us?

21 WITNESS WILLIAMS: Oh, we've  
22 limited it pretty well, Mr. Gibbs, to a water crossing  
23 that -- it is done by, probably done by a separate  
24 construction<sup>crew</sup>, other than the construction spread that  
25 is doing the rest of the line in that section.

26 Q We shouldn't then think  
27 of it as having any particular amount of water flow,  
28 or height of bank, or velocity, or any of those things,  
29 although those may enter into your decision, whether  
30 or not to use a separate crew; but your definition is





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1 that it takes a separate crew to cross the water body?

2 A Yes. Those things would  
3 enter into the decision, it requires some different  
4 equipment, and different techniques, and people that  
5 are specialized in that kind of work; so generally  
6 they're done by a separate crew that specializes in  
7 that type of work. That's the definition that we've  
8 used in this case, Mr. Gibbs.

9 Q I want you to turn your  
10 attention now to Shallow Bay. In the list of activities  
11 that we talked about, they're going to carry it on  
12 there between mid-June and <sup>end of</sup> September, and first of all,  
13 will you tell me how you propose to dig the ditch  
14 across Shallow Bay?

15 A Our plan is to dredge it.

16 Q And what will the dredge  
17 look like, what will it be?

18 A In our cost estimates,  
19 we've provided for quite a large dredge, 36 inch dredge.  
20 It'll be a fair sized piece of floating equipment, with  
21 the excavating equipment mounted on a floating barge  
22 that's designed for the work; and there will be  
23 discharge piping coming from the dredge.

24 Q Well, the dredge will  
25 have, I take it, a bucket, will it?

26 A With a suction line, yes.

27 Q And it'll be mounted on  
28 a barge?

29 A Yes.

30 Q And is that called a



1 lay barge?

2 A No,

3 Q I see. Is it any

4 particular kind of

5 A These larger ones, they're  
6 designed for dredging.

7 Q A normal type of dredge  
8 upon which you find a barge -- or a barge on which  
9 you'd find a dredge mounted.

10

11

12

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Purcell, William, Mine Inc  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 A Well, that's a particular  
2 piece of equipment.

3 Q In common use.

4 A Yes sir.

5 Q Did you say "yes" to that?

6 A Yes.

7 Q What kind of water depth  
8 are you going to be working in, in Shallow Bay?

9 A The maximum depth that our  
10 soundings show is 17 feet of water, and reducing to a  
11 couple of feet in spots, so that the dredge will have  
12 to excavate its channel ahead of it to allow it to  
13 move across the full width of the bay.

14 Q Reducing to how much?

15 A As little as two feet  
16 of water.

17 Q And you're satisfied that  
18 that can be done by that process, that you can excavate  
19 that ditch with the dredge mounted on the barge?

20 A Well, the only quarrel  
21 I have with you is "dredge mounted on the barge", it's  
22 a specific piece of equipment. It's a floating dredge,  
23 yes.

24 Q All right then, Mr.  
25 Williams, in your filing entitled:

26 "Alternative Corridors & Systems of Transportation,"  
27 you considered the offshore corridor, or Arctic Gas  
28 considered it; and at page -- under the tab:

29 "Alternate Corridors"  
30 the yellow tab entitled:





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 "Offshore Corridor,"

2 page 1, I found these words, and it worried me about  
3 your plan to use a dredge, and I'm reading, sir, from  
4 the third paragraph on that page:

5 "The following discussion will demonstrate the  
6 reason for the applicant's conclusion that it  
7 cannot suggest building its proposed pipeline  
8 in the offshore corridor. In addition to the  
9 cost factor noted later, there are at least  
10 two important reasons which relate to the  
11 receipt and continuity of natural gas to  
12 consumers of gas. Because of the present  
13 state of the offshore pipelining arc in coastal  
14 areas which have ice cover over a substantial  
15 period, the applicant cannot conclude that  
16 (a) such a pipeline could be constructed  
17 successfully over the time period within which  
18 the applicant proposes, and  
19 (b) such a pipeline once installed could be  
20 repaired promptly if a pipeline interruption  
21 occurred during freezeup or ice breakup periods."

22 Sir, what's happened to the offshore pipelining arc  
23 since March of 1974 and November of '75 has removed  
24 your doubt about its feasibility?

25 A Oh, you're talking about  
26 two entirely different circumstances, Mr. Gibbs.  
27 The installing a pipeline across Shallow Bay isn't  
28 really, I can't think of in any way comparable to  
29 installing a line in the Beaufort Sea off the North  
30 Coast. They're just not comparable situations.



Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

Q Why do you find them  
not to be comparable?

A Well, one thing is that  
in the Beaufort Sea you can have that ice moving around  
during the summer construction season that would  
damage the equipment and maybe you'd lose your whole  
construction. The ice can be fairly deep and it  
can gouge the bed and rupture the pipe or dent it at  
least.

The second aspect was the  
repair of it. In the Beaufort Sea there would be  
extended periods where repairs would be impossible.  
There are certainly similar periods in the Shallow Bay  
and that's one of the reasons why we've gone to --  
or the most important reason why we've gone to twin  
lines there. It's just a different ball game altogether.

Q Isn't one of the reasons  
the difficulty of operating this dredge in shallow  
water?

A Yes. The route selected  
for study in the offshore proposal was in 20-30 feet  
of water. Where we were looking at several hundred  
-- I don't know the width of the Wildlife Range, it's  
well over 100 miles -- well, if you went in the lagoon  
say between the barrier reefs and the main coastline  
along the offshore -- along the northern coast there,  
and that route was considered to get away from the  
ice problem, to lay the line between the barrier reefs  
and the mainland, then you would get into shallower  
water. It would get away from a lot of the ice movement



Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 problem and the ice scour problem. But yes, it  
2 would be in shallow water and of course it was, from  
3 an environmental aspect it was unacceptable. But I  
4 think that again that's a much different proposition  
5 of having to dredge a channel ahead of you for 150  
6 miles or so, as it is for a couple of miles across  
7 Shallow Bay. I say "a couple" because it's not all  
8 that shallow.

9 Q Well, it's really only a  
10 cost consideration.

11 The problems  
12 are the same, aren't they? Whether it's 150 miles or  
13 two or three miles.

14 A I suppose you could  
15 narrow it down to cost. Because of the mileage invol-  
16 ved in the offshore study, to make any kind of reasonable  
17 progress, a lot more equipment would be required.

18 Q On the second page of  
19 that report on the offshore that I was reading to you,  
20 appears this paragraph:

21 "Shallow water, water depths from 10 to 20  
22 feet,"

23 and it's about that or less than ten feet that you're  
24 talking about in Shallow Bay,

25 "this option would result in the line being  
26 mainly inside the Barrier Islands,"  
27 that's what you told us.

28 "Such location would offer the longest summer  
29 construction season that would be dependent  
30 on the development of new shallow draft marine





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 construction equipment since existing lay  
2 barge equipment for large diameter pipe  
3 requires at least 15 feet of water for  
4 efficient operation. In addition, this  
5 routing has a greater potential for the  
6 disturbance of aquatic and bird life."

7 Does that describe your Shallow Bay exactly?

8 A No sir, not at all.

9 Q And in what way does it  
10 differ?

11 A Because the offshore  
12 plan was to install the pipe off of a lay barge. Now  
13 that's not the dredge. The dredge digs the, excavates  
14 the channel. The lay barge installs the pipe. They  
15 are two separate independent operations. It is not  
16 planned to use a lay barge across Shallow Bay.

17 Q And how many feet of  
18 water is your barge going to draw, 17?

19 A What barge?

20 Q Your dredge.

21 A The channel that it  
22 excavates will be sufficient to float the dredge.

23 Q And what size channel  
24 will it excavate across Shallow Bay? How deep and  
25 how wide?

26 A I think that's shown  
27 in the drawings somewhere, Mr. Gibbs.

28 Q I searched for it and  
29 couldn't find how deep or how wide, because I didn't  
30 know what you were going to use to dig the ditch until





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 this moment.

2 WITNESS CLARK: I believe they  
3 are shown there, Mr. Gibbs. The criteria that was  
4 set, as I recall, was 20 feet below water level or  
5 10 feet below the water, whichever was greater.

6 Q Well, sir, what is going  
7 to be 20 feet below water level?

8 A That's the depth.

9 Q Depth of the trench?

10 A The excavation, yes.  
11 I believe the bottom width was 40 feet.

12 WITNESS HOLLINGSHEAD: Those  
13 drawings were in one of the revisions to the filings.  
14 The revision entitled:

15 "Cross-Delta Alternative,"  
16 I believe it was.

17 Q Could I get that again,  
18 Mr. Clark. 20 feet below water level or --

19 WITNESS CLARK: 20 feet below  
20 water level or 10 feet below the bottom level, whichever  
21 is greater. As I recall, the width at the bottom of  
22 the excavation is 40 feet, but we'll check that.



Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

THE COMMISSIONER: Just going back to your definition of major crossings, Mr. William, you said in response to Mr. Gibbs' question that they were really the crossings where you had decided you needed a separate crew specially trained for that kind of work. What other things do those major crossings have in common that the crossings that your own crews will carry out? I take it one thing they have in common is that they will be built in the summertime.

WITNESS WILLIAMS: No sir.

Q The major crossings?

A The only crossings that are scheduled for summer construction are these major ones that we've listed.

Q In the delta?

A In the delta, plus East Channel.

Q Plus East Channel, yes.

A At, near Tununuk Point and the Mackenzie crossing near Fort Simpson and the Great Bear Crossing near Fort Norman.

Q Yes, but those are the major crossings and they will all be built in the summertime, is that so?

A Yes sir.

Q Now -- so that these major crossings will all be built in the summer by a separate crew. Is there one other thing they have in



Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

common, that is that there is no permafrost beneath the  
river or channel in each instance?

A No permafrost at ditch  
depth. Shallow Bay does have some permafrost, but it's  
deeper than what we're going in and I have no doubt that  
applies to some of the other crossings, but within  
ditch depth, with the exception of the embankments, of  
course, there will be permafrost in the embankments.

Q Yes. Well, just so  
we're on the same wavelength here, I wish we had that  
map of the -- that other map of the -- your crossing of  
the -- here. Your crossing of the East Channel is  
the Swimming Point crossing, isn't it?

A Yes sir. Well, not  
with the revised cross-delta filing. It's not at  
Swimming Point anymore, it's closer to Tununuk.

Q Tununuk, right. O.K.  
Then, the other crossing -- the next major crossing is  
the Bear River and then south of Fort Simpson.

A Yes sir. The other  
crossings are planned for winter construction for the  
crew that is doing the rest of the work in that area.

Q Yes.

A By the crew.

Q Right, leaving out the  
ones you and I have just been talking about. The rest  
is summer construction by your own crew.

A Winter.

Q I mean winter.





Hollingshead, Cooper,  
Williams, Winning,  
Clark, Purcell,  
Cross-Exam by Gibbs

A Yes sir.

THE COMMISSIONER: Yes right.

Well, carry on Mr. Gibbs. Maybe they found this material.

WITNESS HOLLINGSHEAD: Well, those figures that Dr. Clark gave you are correct as far as the depths are concerned. The top<sup>of the</sup> pipe was to be set at a depth of about 20 feet below water level or ten feet below bed level whichever was the lower.

MR. GIBBS: I'm sorry, the top of the pipe so the bottom of the trench is going to be at least another four feet.

A It would be another four to five feet below -- four feet below that, I guess.

WITNESS CLARK: I think I was a little high on the width of the bottom of that trench, Mr. Gibbs.

Q I'm sorry.

A I was a little high on the width of the bottom of the excavation.

WITNESS HOLLINGSHEAD: I don't think we have a precise figure on the width of the trench, but presumably, it would be the normal sweep of a dredge of this size and I don't know what the minimum figure would be but --

WITNESS CLARK: It's probably closer to 25 to 30 feet rather than 40.

MR. GIBBS: Can anybody bid a better number than that, Mr. Williams?



Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

WITNESS WILLIAMS: Well

certainly one consideration is the width of the dredge  
that has to go into the channel.

Q Yes.

A Otherwise, other con-  
siderations are how well the material stands up when  
excavated and I think you would keep it down to the  
minimum within those limits.

Q Yes sir, but how wide  
at the top and how wide at the bottom? Surely you've  
made some determination of those for your logistics  
purposes?

WITNESS HOLLINGSHEAD: Well,  
the width, certainly at the top of the ditch is going  
to be a function of the depth of the ditch as well and  
that varies all the way across Shallow Bay, but I  
think if you want some approximate numbers, you're  
probably looking at about a bottom width of something  
in the order of 20 feet and the top width maybe in the  
order of -- on averages, probably in the order of 100  
feet. Perhaps less in some places, greater in others.

THE COMMISSIONER: The width  
of the ditch at the top is going to be about 100 feet.  
That's what you're saying, to accomodate the barge then --

WITNESS CLARK: The side slopes  
we assumed -- I believe we assumed a four to one side  
slope.

Q Yes.

A So, starting with a bottom



Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

width of 20 feet, if we're ten feet down, that would  
give a 100 foot wide width and we wouldn't be much more  
than--

Q I'm with you. Let me  
just go back to the level of the ditch. You said the  
pipe would be laid -- that is the top of the pipe would  
be 20 feet below the water level or ten feet below the  
bottom of Shallow Bay.

WITNESS CLARK: That's correct.  
WITNESS

HOLLINGSHEAD: On the  
drawings sir, that I was referring to which were in the  
exhibits the top of pipe elevation is given as 160  
feet. The designed high water level is given as --  
it looks like 188, on my copy, but it's pretty small.  
The water level in April, '74, which was the date of  
the soundings -- the month that the soundings were  
taken is given as 180. The general sort of bed level  
if you like across Shallow Bay ranges from 175 to say  
as low as 160 -- 165 to 175. That is, you have in the  
order of five to 15 feet of water below the April ice  
level if you like.

Q Yes.

A The top of the pipe  
was set on this preliminary design was set at 20 feet  
below that.

MR. GIBBS: How many dredges  
will you operate at Shallow Bay during that one summer  
season from mid-June to end of September?

WITNESS WILLIAMS: The present  
cost estimate is based on one large dredge, Mr. Gibbs.





Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

But we're still studying that aspect and that may change.

Q I take it that your plan then is to have this dredge start at one side of Shallow Bay and dig 100 foot wide trench across the bottom for 4½ miles and then turn around and come back, digging another one because you've got two 36 inches to put in?

A Not necessarily. There are environmental problems there, Mr. Gibbs, as you know with the whales and that may determine where the dredge will be working when. For instance, the channel -- the deep channel is towards the west side of Shallow Bay. The easterly two miles of Shallow Bay are very shallow. If it's environmentally acceptable, it's possible that the dredge might start at the deep channel and work easterly in that shallow section while the whales may wish to inhabit the deeper section. There are some -- some tradeoffs are going to have to be made to fit this thing in to the satisfaction of everyone concerned so it's not necessarily from one side to the other and back again.

Q Have you ever operated one of these dredges, Mr. Williams?

A No sir, I haven't.

Q Has anyone in Northern Engineering Services ever operated one?

A You mean physically sat up there and pulled levers?

Q Been with it while it was





Hollingshead, Cooper,  
Williams, Minning,  
Clark, Purcell,  
Cross-Exam by Gibbs

operating.

A Oh yes.

Q At what rate per day can  
that dredge dig its 100 foot wide trench, some 14 feet  
deep?

A That's a number that I'd  
like to get tonight, Mr. Gibbs. I've been thinking  
about it today and a 36 inch dredge, it seems to me,  
is capable of around 50,000 yards a day. But, I'd  
like to check that number. I have it back at the  
office and it escapes me right now.



Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

Q Was it feet per day?

WITNESS HOLLINGSHEAD: He said  
50,000 cubic yards.

Q Well, I guess I can take  
out my little electronic calculator and work that out  
from this volume. Is it going to progress the length  
of this in feet per day of yards or what?

MR. MARSHALL: Mr. Williams  
has indicated he wanted to check the figure. Perhaps  
if you wanted it in terms of feet per day we could  
calculate that tonight and you can carry on with your  
discussion tomorrow.

MR. GIBBS: Maybe he'd like to  
calculate a bit more. I'm going to end up asking how  
he knows how much this delta route is going to cost  
him. He doesn't know how many barges, and he doesn't  
really certain of how many feet per day.

WITNESS CLARK: We have that  
figure, Mr. Gibbs. It's been worked out. It's not  
right on the top of our head. I've worked out the  
total number of days to do the entire trench. I don't  
remember, but it was a relatively small number of the  
capacity that that barge has. WE'll get you that  
tomorrow.

Q Do you have the number  
of total days in your head rather than the progress?

A Not exactly. I would  
sooner check my notes.

Q Will you get that also?

A Yes.



Parcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 Q And was that based on  
2 dredge days or the number of days using one dredge or --

3 A The calculation I made  
4 was based on the number of days using one dredge.

5 Q And the dredge, Mr.  
6 Williams, scoops the silt and sand out of the bottom  
7 of Shallow Bay, does it?

8 WITNESS WILLIAMS: Yes sir.

9 Q And then that's taken  
10 from the bucket by some kind of siphoning hose?

11 A Yes sir.

12 Q And where is it deposited?

13 A Downstream.

14 Q How?

15 A Through the discharge  
16 piping.

17 Q Do you dump it over the  
18 edge of the dredge?

19 A No, we're talking about  
20 discharge piping and this can be several hundreds of  
21 feet long.

22 Q And would it be?

23 A That's normal standard  
24 practice , yes.

25 Q Is that what you're  
26 going to do?

27 A Yes, we've always said  
28 we're going to discharge the excavated material downstream  
29 of the trench.

30 Q But you have no plan to





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 offload it into barges and take it away somewhere  
2 and dump it?

3 A No sir, we have said that  
4 we have given consideration to doing some dredging  
5 a year early to use the excavated material for construc-  
6 ting of the work pads required on shore, that is the  
7 core of the work pads, and put up the pad of excavated  
8 dredged material and then cover them with gravel in  
9 the following winter. This is one procedure that  
10 could be used. On the other hand, the environmental  
11 people would like the activity confined to as short  
12 a time as possible, hopefully one season, and again  
13 this has to be worked out with them. If that's not  
14 possible, then the gravel required for the pads would  
15 have to be hauled in.

16 Q Mr. Williams, what's  
17 your present plan, to dump the material into a hose  
18 and run it off 100 feet or so, and deposit on the  
19 bottom of Shallow Bay?

20 A Yes sir.

21 Q For both trenches?

22 A Yes sir.

23 Q How far apart are the lines  
24 going to be across Shallow Bay?

25 A 200 feet.

26 Q And I guess I needn't  
27 remind you that if you dump it 200 feet from one you  
28 might drop it on the other.

29 A That wouldn't be too bad,  
30 would it?



Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 Q Now, Mr. Williams, when  
2 your trench is dug, how are you going to keep it open  
3 till you put the pipe in?

4 A The work -- the limited  
5 work that was done this summer, Mr. Gibbs, shows that  
6 it stands up pretty well. Of course, some over-excava-  
7 tion will be required to take care of the siltation  
8 that may occur between the time of excavation and the  
9 time of installation.

10 Q You propose then to  
11 open the trench like you would on dry ground and  
12 leave it open until you put the pipe in?

13 A Yes sir.

14 Q And do you have to open  
15 the trench right on one side of Shallow Bay to the  
16 other before you put the pipe into it?

17 A Yes sir.

18 Q And how do you propose  
19 to lay the pipe, Mr. Williams, once the trench is  
20 opened?

21 A To pull it out.

22 Q Can you describe that  
23 process?

24 A Yes, these were pads that  
25 we talked about on the shoreline are built up above  
26 the spring flood or summer storm level, pipe is  
27 brought into the site either conc rete-coated or  
28 the concrete coating could be done at the site.  
29 The pipe is welded up into strings, 1,500-2,000 feet  
30 long, and a cable and a winch would be placed on the



Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 opposite side of the bay, and the pipe will be equipped  
2 with floatation tanks to keep it riding just up off  
3 the bottom of the trench as the pull is made, and  
4 the first 1,500 or 2,000-foot section would be pulled  
5 in, and the next one would be welded onto that and the  
6 pull would continue, similar to other river crossing  
7 procedures. It's just a little bit longer.

8 Q How will you make sure  
9 that the pipe is above the trench, Mr. Williams?

10 A The current in Shallow  
11 Bay is, in the summer time is not that high, Mr. Gibbs,  
12 but some other tugs and what-not will be required  
13 for assistance.

14 Q Yes, you've got a 4½-mile  
15 length of floating pipe, so something is going to  
16 have to anchor it over the trench before you lower it.

17 A Sure.

18 Q And will you lay both  
19 strings at once, or in sequence for the two 36s?

20 A No, I would see them  
21 not done at the same time. One at a time.

22 Q So that leaving aside  
23 the preparatory work, so far what you're doing between  
24 mid-June and the end of September in Shallow Bay is  
25 digging two trenches in the bottom in silt and sand  
26 100 feet wide, and in sequence putting in 4½ miles of  
27 pipe strings. Is that right?

28 A Yes sir.

29 Q But before you do the  
30 pipe stringing, you've got all of the welding and





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

1 weighting and fixing of anchors and so on to do on  
2 the pad alongside ship?

3 A That can be done well  
4 ahead of time, or while the dredging excavation is  
5 going on.

6 Q Yes sir, when I went  
7 through the list of activities, I began with mobiliza-  
8 tion, I understood that you were thinking of mid-June  
9 for mobilization, so your activities are not going  
10 to start before then, are they?

11 A Well, we do show some  
12 preparatory work going on ahead of that in the bar  
13 chart, Mr. Gibbs. The approach work, and I've described  
14 earlier the construction of the work pads.

15 Q Mr. Williams, in what  
16 depth of water -- to what depth of water can your  
17 dredge work?

18 A You're speaking of  
19 maximum depth?

20 Q Yes.

21 A Rather than minimum. It's  
22 in excess of 100 feet, Mr. Gibbs.

23 Q Will you use the same  
24 kind of dredge on each of the delta crossings that  
25 you construct in the summertime?

26 A Possibly, yes.

27 Q Possibly sir, will you?

28 A We have a plan, Mr. Gibbs,  
29 that is subject to change, but the present plan is  
30 based on using the same type of dredge, yes.





Purcell, Williams, Minning  
Hollingshead, Cooper, Clark  
Cross-Exam by Gibbs

Q All right, sir, it's  
the present plan that I'm interested in.

THE COMMISSIONER: Perhaps we  
could adjourn now, if it's all right with you, and I  
think our hours of sitting are 9:30 to 12:30, and then  
2 till 5, is that? That's the program. Well, we'll sit  
those hours for the rest of the week until Friday after-  
noon, and we will not sit next Monday, so we'll resume  
next Tuesday at 1 A.M. I just want to -- 1 P.M. --  
I just want to go home for the weekend and that means  
I can fly back Monday without overnighting in Edmonton.

So we'll adjourn till 9:30  
in the morning then.

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Mackenzie Valley Pipeline-  
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